

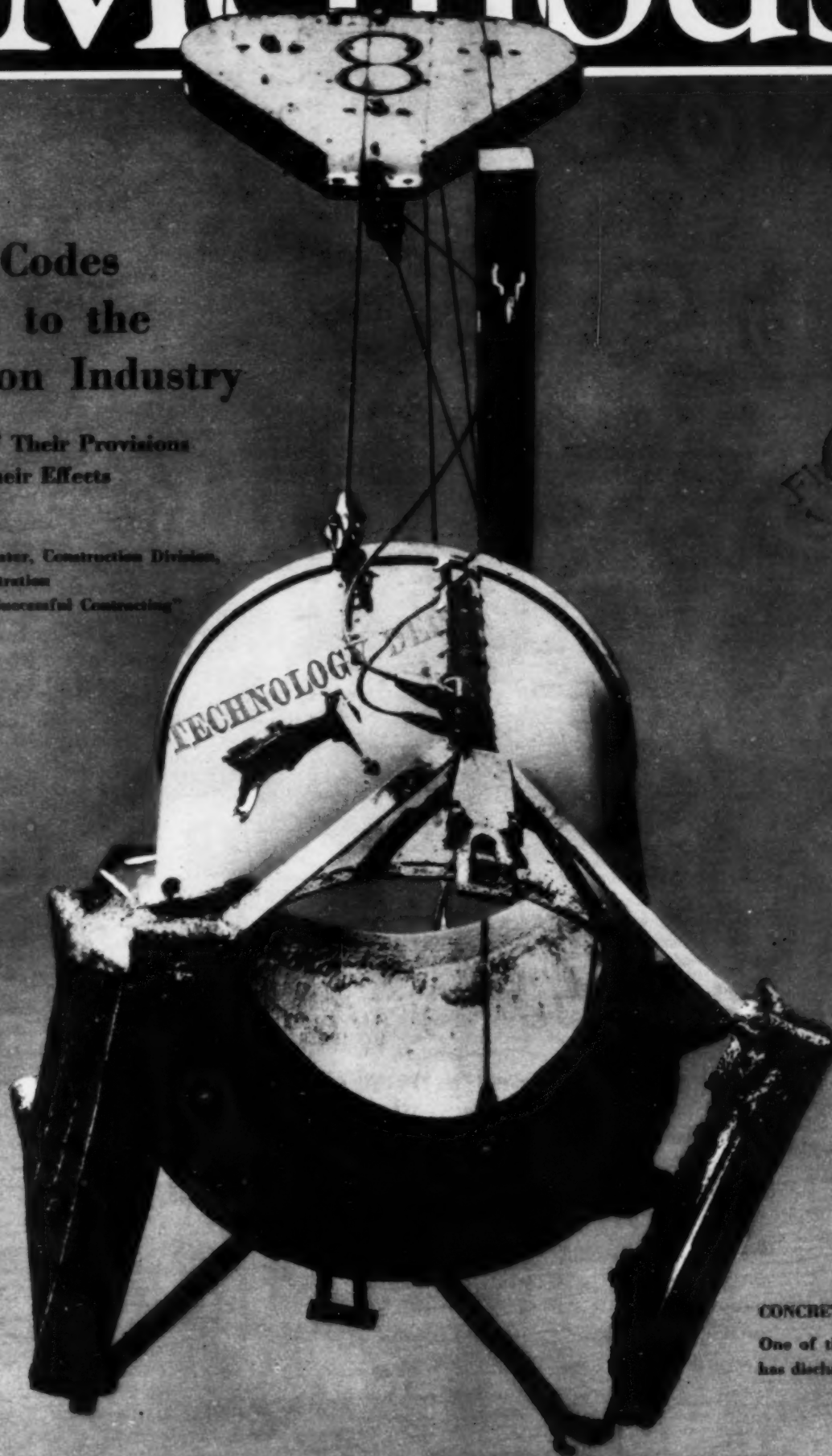
# Construction Methods

## What the Codes Will Mean to the Construction Industry

An Interpretation of Their Provisions  
and a Forecast of Their Effects

By Harry O. Locher

Assistant Deputy Administrator, Construction Division,  
National Recovery Administration  
And Author of "Helps to Successful Contracting"



### CONCRETING AT BOULDER DAM

One of the 8-cu. yd. cableway buckets  
has discharged its hatch into the forms.

U. S. Bureau of Reclamation Photo



*Use the right* **CORDEAU**  
*for the job*

Use Plain Cordeau for hooking up the holes above ground, and Countered Cordeau for the holes themselves. The size and depth of the hole will determine the type of Cordeau needed. Five types are available: Plain, the lead sheath being without reinforcement; Countered, with one wrap of cotton yarn; and Double Countered. For very deep holes and other unusual conditions we recommend Wire Bound Cordeau, No. 1 or No. 2.

There is a new book, "The Ensign-Bickford Detonating Fuse," which explains how to use Cordeau profitably. Sent free to executives.

**CORDEAU**  
**DETONATING FUSE**  
**BICKFORD**  
THE ENSIGN-BICKFORD COMPANY

*Yes! it can be profitable to hook up jackhammer holes with Cordeau-*

... of the 'Cordeau-Bickford Detonating Fuse' is no limit to the number of holes that can be connected at one time. Each load will have added force because every cartridge will be in contact with the detonating agent. ... will be in contact with your explosives, better work from your explosives. ... along is an illustration

## **CORDEAU is an insensitive DETONATOR**

Cordeau is a lead-encased core of TNT, insensitive, and must be detonated by a fuse cap or E-B cap. When so detonated it carries an explosive wave at a speed of approximately three miles per second; practically instantaneous, yet permitting the blast to be so planned as to relieve burden through successive detonations.

The proper use of Cordeau has been found to result in more work from the explosives. The line of Cordeau, extending from the bottom to the top of each hole, detonates every cartridge in each load. Thus each cartridge is,

in effect, a *primer* cartridge, having *added* force—doing more work.

The use of Cordeau simplifies loading, permits giant hook-ups, reduces misfires—results in more efficient blasting. Perhaps you can use it to advantage in *more* of your blasting.

**CORDEAU**  
**DETONATING FUSE**  
**BICKFORD**

**THE ENSIGN-BICKFORD COMPANY, Simsbury, Connecticut**

This book explains Cordeau-Bickford Detonating Fuse and shows how it can be used profitably. Sent free to executives.

CB-31

TECHNOLOGY DEPT.

June, 1934—CONSTRUCTION METHODS



## Appeals Board Named by Code Authority

● The Construction Code Authority last month elected the nine members of the Construction Appeals Board provided for in Chapter I of the Code. Wilson T. Ballard, consulting engineer, of the J. E. Greiner Co., Baltimore, has been named chairman and John W. Cowper, general contractor, of Buffalo, N. Y., vice-chairman. The board consists of one architect, one engineer, three general contractors and four sub-contractors. The board will hear and determine appeals made from divisional code authority decisions and will settle controversies arising from provisions of the various chapters of the code.

## Additional Interpretations of Construction Code

● In addition to the six official interpretations of Construction Code provisions reported on this page last month the Construction Code Authority has ruled on the following two cases:

The first deals with an important aspect of the code which has been misunderstood by both general and special contractors. The general contractor in this case stated that he does not take sub-bids, but figures all of his own work in preparation of his general contract bid; if awarded the contract, he then invites sub-bids. According to his reading of the code, this method was prohibited, and he felt that he would be either driven from business or forced to take sub-bids before submitting his own bid. However, the Construction Code Authority explains that under the code a general contractor may bid on a job without requesting or securing sub-bids in any line. If awarded the contract, he may then proceed on the basis of Article VII of Chapter I as an awarding authority to request and receive bids.

The second explanation concerns Section 7, Article VII of Chapter I. The second sentence of this section states that "all bids to be submitted by subcontractors shall be delivered to the contractor not less than 24 hr. prior to the time set for the receipt of the bid of said contractor by the awarding authority." Asked whether sub-bids could be accepted by the contractor if mailed and postmarked at least 24 hr. prior to the time the general contractor submitted his bid, the code authority states that sub-bids must be in the physical possession of the general contractor 24 hr. prior to the time stated.

## Col. Waite Decries Strikes

● On the occasion of the ceremonies last month marking the start of construction on the Midtown Hudson tunnel linking Manhattan Island and New

ROBERT K. TOMLIN,  
Editor

McGraw-Hill Publishing Company, Inc.,  
330 West 42nd St., New York

JUNE 1934

WILLARD CHEVALIER,  
Vice-President

Editorial Staff: Vincent B. Smith, N. A. Bowers (San Francisco)  
Leonard H. Church (Cleveland), Nelle Fitzgerald



Fitzpatrick, in the St. Louis Post-Dispatch

## Coming Out of the Storm Cellar

Jersey, the first major PWA project adopted for the New York area, Col. Henry M. Waite, deputy federal administrator of public works, said, in part:

"Labor must realize that it has a vast, unselfish duty to perform. The public is struggling in every way possible to get people back to work. The public mind cannot understand, nor will it tolerate, strikes. When people are demanding work, with vast throngs on relief rolls, the public mind cannot comprehend why those having work strike.

"This is the opportunity for labor leaders to show statesmanship and leadership. The representatives of labor in Washington are alive to this situation. They see the country as a whole. The difficulty is that the local leaders do not see the entire picture. The Administration has been liberal in its interpreta-

tion of the rights of collective bargaining. It has set up the machinery to protect such bargaining, the intention being to avoid the necessity of labor striking. Petty and local differences will not be allowed to interfere with the great movement of getting people back on pay rolls."

## Status of PWA Fund

● Construction representing an outlay of a billion and a quarter dollars of PWA's \$3,300,000,000 fund has been awarded by contract or begun by day labor, according to an announcement by Public Works Administrator Ickes early last month. A recapitulation of PWA allotments as of April 30, including a number of changes, shows the following division of funds:

Executive and legislative allotments,

\$1,122,746,900; special allotments, \$9,990,145; Federal projects, \$1,381,867,245; Non-Federal projects, \$778,591,898.

Included in the compilation were allotments for 15,688 projects, of which 13,200 were Federal and 2,488 were non-Federal.

## A. G. C. Resolutions

● At the spring meeting of the board of the Associated General Contractors of America in Washington last month approved resolutions asked for a public-works fund for the coming fiscal year at least equal to that of the current year, endorsed the Cartright bill providing \$400,000,000 for highway appropriations, urged that governmental agencies operate under the Construction Code, objected to the Trucking Code provision calling for registration and a fee for "not for hire" trucks, and requested removal of the stay order exempting real-estate development companies from the Construction Code.

## Labor Provisions Must be Posted

● Regulations requiring employers operating under approved codes to post conspicuously the labor provisions of those codes affecting hours of labor, rates of pay and other conditions of employment, were issued late last month by the NRA, in accordance with an executive order by the President. Posting of the provisions is designed not only to acquaint employees with their rights under codes, but also to protect employers from complaints made in ignorance of code provisions and to protect faithfully complying employers from chiseling competitors. Code Authorities will furnish the required number of official copies (prepared by NRA) of labor provisions for posting.

## To Protect Employees Who Report Code Violations

● President Roosevelt has issued an executive order giving complete protection in their jobs to employees who make complaints or give information concerning alleged code violations on the part of their employers.

The order decrees that no employer subject to a code shall dismiss or demote any employee for making a complaint or giving evidence with respect to code violations under penalty of a \$500 fine or six months imprisonment, or both.

In numerous cases before the National Labor Board, employees have charged that their employers have demoted or otherwise penalized them for making complaints or giving testimony regarding alleged code violations.

# No Substitute for Practical Skill

IN TIMES such as these it is easy to forget fundamentals. A host of current problems press for solution. Each, as it rises, dominates our thought, and for the moment seems to be of first importance. The very urgency of our plight tends to obscure every consideration except that of the moment. Expediency is king and rules our policies.

These current problems, moreover, may not be of general concern. To each individual or group the emergency shows a distinctive side. Each, therefore, has his own idea as to what should be done about it. Each, intent on self-preservation, is for that which best serves his own interest regardless of its effect upon other groups or other individuals. Principles are submerged in the desperate struggle for survival.

Thus it is that group solutions are but compromises between temporary and conflicting interests. Those concerned have but two cares: to survive the day and to devise some formula of sufficiently general appeal to command action. Neither of these puts a premium on the general welfare or on the long-term interest of the group itself. We must compromise between what may be sound and what certainly is expedient.

These reflections are inspired by no failure to recognize the compelling need for such compromises. If we cannot survive the short term there is scant need to plan for the long term. Yet even today, despite our current preoccupation, it is worth while to recall some fundamentals that are universal and eternal, however they may be overshadowed by the more obvious influences of the moment.

Chief among these is the certainty that in the long run no laws, no codes, no artificial stimulants can maintain the progress or foster the well-being of the construction industry. However effectively all these may help us to weather a storm they cannot speed us on our course. They may keep us afloat but the passing of the crisis will but leave us wallowing unless we conserve the one power that makes for progress in any industry.

That power is technical skill; for it there is no substitute. The amazing accomplishment of the American constructor is the product of his technical proficiency; his even greater achievements of tomorrow will result from his continued growth in proficiency. The demand for his services and the profits that he may derive from that demand will not result from laws, codes or emergency appropriations. They will be measured by his resourcefulness in tackling unusual construction problems, his skill in planning his operations, selecting and handling his materials and plant, administering his organization and in all the rest of the technique by which men build finer works and structures at lower cost in time and money.

This detracts in no measure from what has been so admirably accomplished during the last year in behalf of the non-technical concerns of the industry. This is vital, not alone to meet the emergency but also as a contribution to the permanent health of the industry. The suppression of abuses gives a better break to technical skill and enhances the overall efficiency of the industry. But in our preoccupation with administrative practice we dare not forget the primary requirement of practical proficiency in our craft.

This requirement *Construction Methods* seeks constantly to serve. It is devoted to the practical aspects of construction operations; its mission is to help construction men everywhere to carry on the day's work with greater skill, efficiency, and profit. It believes that, after all has been said and done, this must remain the vital factor in construction progress, just as it is the vital factor in all industrial progress.

For eight years under its present management, *Construction Methods* has adhered to this mission through thick and thin. Now, on its eighth anniversary, it conceives this mission to be more worthy than ever of its best efforts during the days just ahead of us.

*Willard Chevalier*

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# TOUGH JOBS ?

*Bear Cat Jr.  
moves a mountain of  
melted foundry refuse  
below estimated  
cost ...*



*Look at these* **“CHUNKS”**

Can the Bear Cat Junior handle tough jobs? Is it rugged, substantially built, and profitable to use?

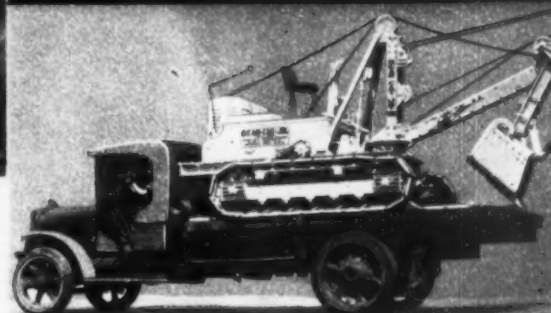
Just look at the mountain it is moving for American Metal Co., Ltd., Langeloth, Pa., **BELOW ESTIMATED COST!** This solid mountain of melted foundry refuse containing iron, copper and zinc, had to be blasted first ... then Bear Cat

Junior loads the heavy refuse into mine cars, handling chunks twice the size of the bucket.

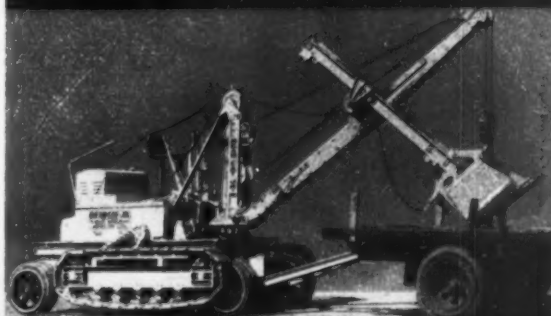
If you want to save money or make more money on digging or excavating jobs ... if portability means anything to you ... if digging all day on 10 gallons of gas and a quarter pint of oil sounds interesting ...

**Send for the Free Book “BEAR CAT JUNIOR FACTS”**

**YOU CAN'T BEAT IT FOR PORTABILITY**



**25 MILES PER HR. BY TRUCK OR TRAILER**



★ **Bearcat Shovel Works** ★

**DIVISION BYERS MACHINE CO.**

40 SYCAMORE STREET

RAVENNA OHIO.

*Something New has been  
accomplished that fits the  
needs of every Contractor*

A UNIT THAT HAS

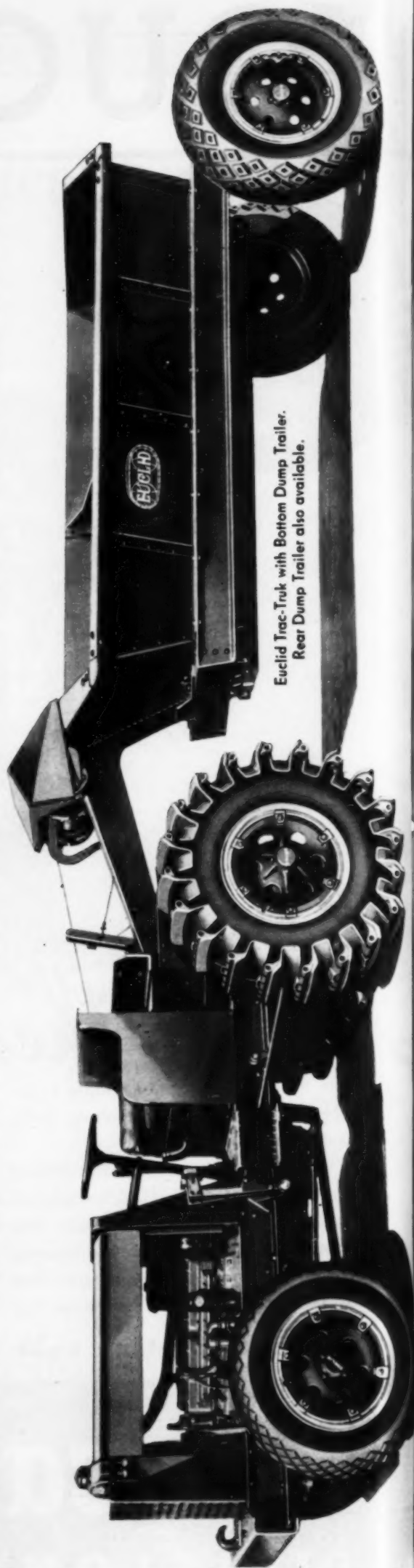
**POWER  
SPEED  
TRACTION  
MOBILITY**

CO-ORDINATED TO EASILY  
MEET CONDITIONS ON  
ALL HAULING JOBS

*The New*

# **EUCLID "TRAC-TRUK"**

**COMBINES ADVANTAGES OF BOTH TRUCKS AND CRAWLER UNITS**



Euclid Trac-Truk with Bottom Dump Trailer.  
Rear Dump Trailer also available.



# STARTING A NEW EPOCH IN MATERIALS HAULING THE EQUIPMENT THAT CONTRACTORS HAVE BEEN WAITING FOR

## A VERSATILE PERFORMER THAT CUTS "HAULING COSTS" IN HALF

Dams, Levee Building, Highway and City Street Construction, Building Excavation, Quarry Work or General Road Maintenance—The New Euclid Trac-Truk is the ideal HAULING EQUIPMENT INVESTMENT for every job.

Think of hauling eight yards of dirt or construction materials at fifteen miles per hour—moving twice the customary yardage per hour at no greater investment . . . reducing operating cost, fuel, grease, oil and maintenance to levels heretofore impossible . . . crawler tractor and wagon efficiency over soft going or the speed and mobility of trucks on dry ground. That's the kind of per-

formance that the Euclid "Trac-Truk" is demonstrating on a wide variety of jobs.

## NEW TRAC-TRUK MECHANICAL FEATURES INSURE GREATER SPEEDS . . . NEW ECONOMIES

Every advantage of proved Euclid engineering is embodied in this new unit. Speeds excel that of motor trucks in hauling heavy loads over rough or soft going. A 100 H.P. engine insures ample power to operate under severest conditions. A patented, Wheel-Drive design provides for easy maneuverability and greater use of power. Large size, low-pressure tires on both tractor and trailer unit afford wide ground contact and sure traction.

Of notable importance are the Wheel Tracks . . . readily attachable or removable . . . which not only provide positive traction on soft or slippery ground but serve as armor protection to tires when used in rock work.

## PROVEN PERFORMANCE

This equipment carries the endorsement, in actual purchases, of some of the largest contracting firms whose jobs were the "testing grounds" for the Trac-Truk. Pitted against a wide variety of conditions—critically compared against the older types of equipment—the Euclid Trac-Truk required no salesmanship . . . IT SOLD ITSELF ON EVERY JOB. Write direct for actual, comparative operating costs and complete descriptive literature.



## THE NEW EUCLID "TRAC-TRUK" TRACTOR PROVIDES ALL-PURPOSE PORTABLE POWER

The "Trac-Truk" Tractor, easily detachable from the bottom dump trailer is an ideal power unit for use with scraper, grader or other construction equipment. There is a front pull-hook for general uses and a heavy hitch adaptable for draw-bar purposes.

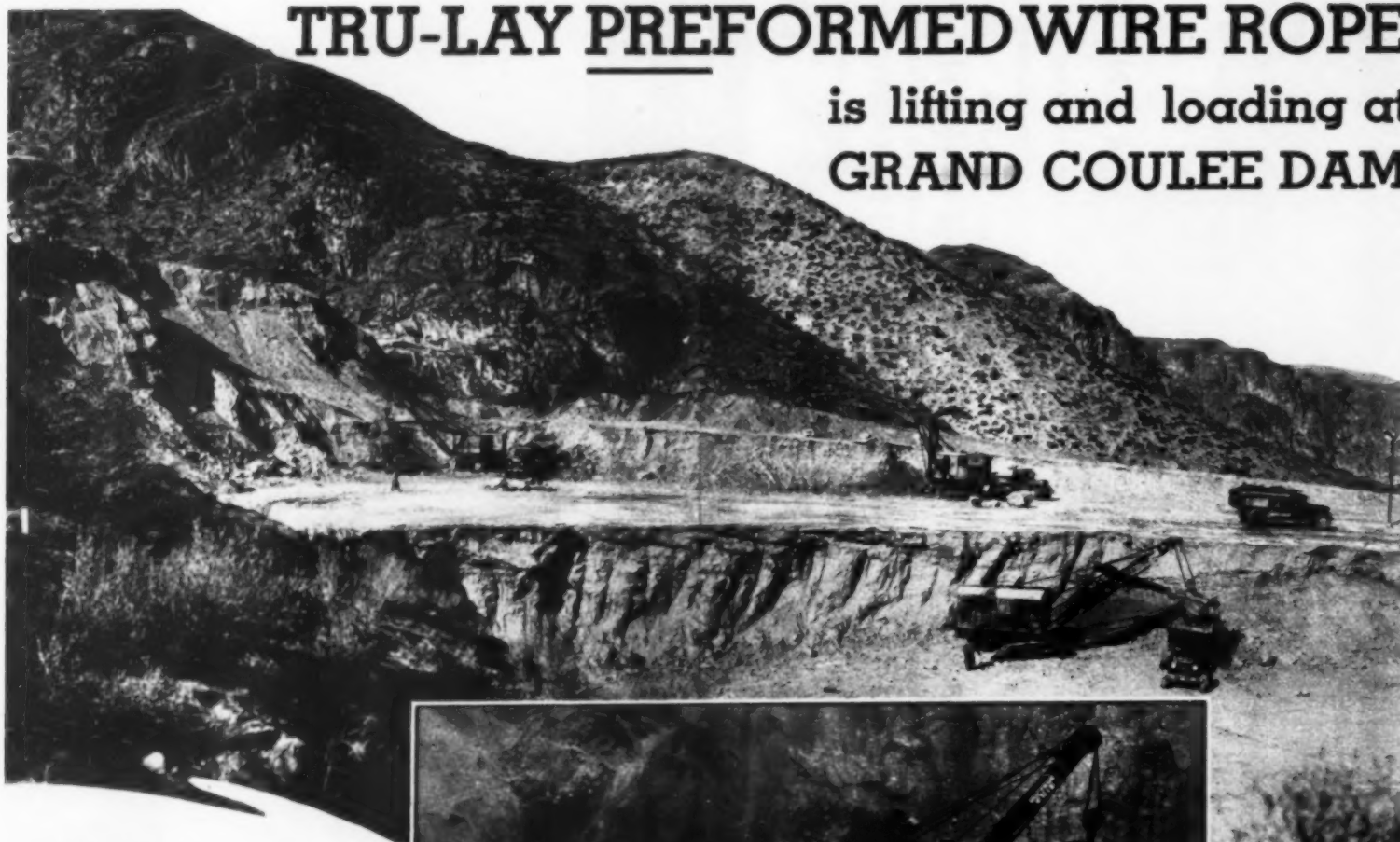
Here again, is the co-ordination of power, versatility, speed and mobility that provides unequalled economies for construction and industrial requirements.



THE EUCLID ROAD MACHINERY CO., CLEVELAND, O.

# TRU-LAY PREFORMED WIRE ROPE

is lifting and loading at  
GRAND COULEE DAM



Goodfellow Brothers are the contractors who have accepted responsibility for this tremendous excavation job. Practically all wire rope they use on their shovels is Tru-Lay. In their experience, as in that of many others, Tru-Lay Preformed Wire Rope gives decidedly longer service than ordinary wire rope.

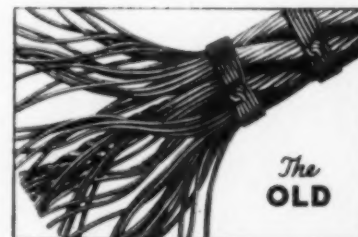


## 1,200,000 cubic yards of excavation and Goodfellow Brothers use Tru-Lay

The reason Tru-Lay Preformed Wire Rope will play such an important part in this great undertaking is the real economy which comes from using a wire rope which has no internal stress or strain.

Preforming removes the tendency to high strand or low strand, kinking, bird-caging and other faults. Tru-Lay Preformed Rope is easier to splice. It handles better and requires no seizing. All of these things mean money to the contractor.

Let us explain to you fully, the longer life and many great advantages of Tru-Lay Preformed Wire Rope. Send for literature or ask our representative to call.



UNRETOUCHED PHOTO OF  
ORDINARY WIRE ROPE



UNRETOUCHED PHOTO OF TRU-LAY PREFORMED WIRE ROPE



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Company of the  
American  
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**WILKES-BARRE, PA.**

*District Offices:*

Atlanta • Chicago • Denver • Detroit • New York • Philadelphia  
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# TIME

—the unseen  
Ingredient

*While concrete hardens, traffic  
is detoured, merchants lose sales  
—How 24-hour Cement prevents  
these losses*



NO LOST SALES HERE. Canal Street, New Orleans, commercial hub of the far South, had to be repaved. Merchants demanded quick action so 'Incor' 24-Hour Cement was used. Eighteen blocks were paved, a section at a time. New concrete, placed one day, was in use the next. Traffic was not diverted, business was unaffected. Merchants estimate this saved \$5,000,000 sales loss.



## *Concrete poured today, ready for traffic tomorrow*

Concrete's unseen ingredient is Time—the time consumed in hardening—once 28 days, then 14, now 10. But even ten days is much too long when you consider what this delay means. When traffic is diverted, business withers, merchants lose sales that never return. Motorists travel needless extra miles over dusty detours.

Now this problem is solved by a cement called 'Incor' which hardens *seven times as fast* as ordinary Portland cement. With 'Incor' 24-Hour Cement, the mixer pours concrete today—tomorrow you drive over it. In concrete buildings, column forms are stripped first morning after concreting, floor forms that afternoon; one form-set does the work of several, reducing form and handling costs; financing expense reduced, revenue from investment begins sooner. Result, a new era in concrete construction.

And 'Incor' makes better concrete because it is a perfected Portland cement. Its price is now little more than ordinary cement—a fraction of resulting economies. 'Incor'\* is made by the producers of Lone Star Cement—subsidiaries of International Cement Corporation, New York, and is sold by other leading cement manufacturers.

\*Reg. U. S. Pat. Off.

# 'INCOR' 24-Hour Cement

*Railroad Avenue, White Bear, Minnesota, Tarvia-built in 1920. The modern gasoline filling station which has supplanted the old "false-front" frame buildings is typical of the changes in American towns and villages since this pavement was put in service.*



● Railroad Avenue's fourteen years of uninterrupted service tells you, as well as anything could, why Tarvia belongs in your road program. Long-lived Tarvia roads are not exceptional. Highway officials all over the country have had similar experiences with Tarvia. They know that a Tarvia pavement needs only the simplest and most inexpensive maintenance to make it last indefinitely—always smooth, easy-riding, skid-safe.



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Milwaukee Toledo Cincinnati Portland, Me.

New York Chicago Birmingham Philadelphia Minneapolis Boston Cleveland Detroit  
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In Canada: THE BARRETT COMPANY, LTD. Montreal Toronto Winnipeg Vancouver





Silent, desolate, barren—suddenly the picture changes—plans, action, men, equipment—and a reclamation project is under way.

Here and there in this age of wonders, one sees construction accomplishments that are masterpieces of man's genius. Engineering ability seems not limited but expands as conditions dictate to cope with the requirements of the world.

The engineering that has produced "AMERICAN" Hoisting Equipment has always been progressive and therefore the resultant quality will have the same definite value in the construction of the future as in that of the past.

AMERICAN HOIST & DERRICK CO.  
SAINT PAUL, MINNESOTA

**AMERICAN**

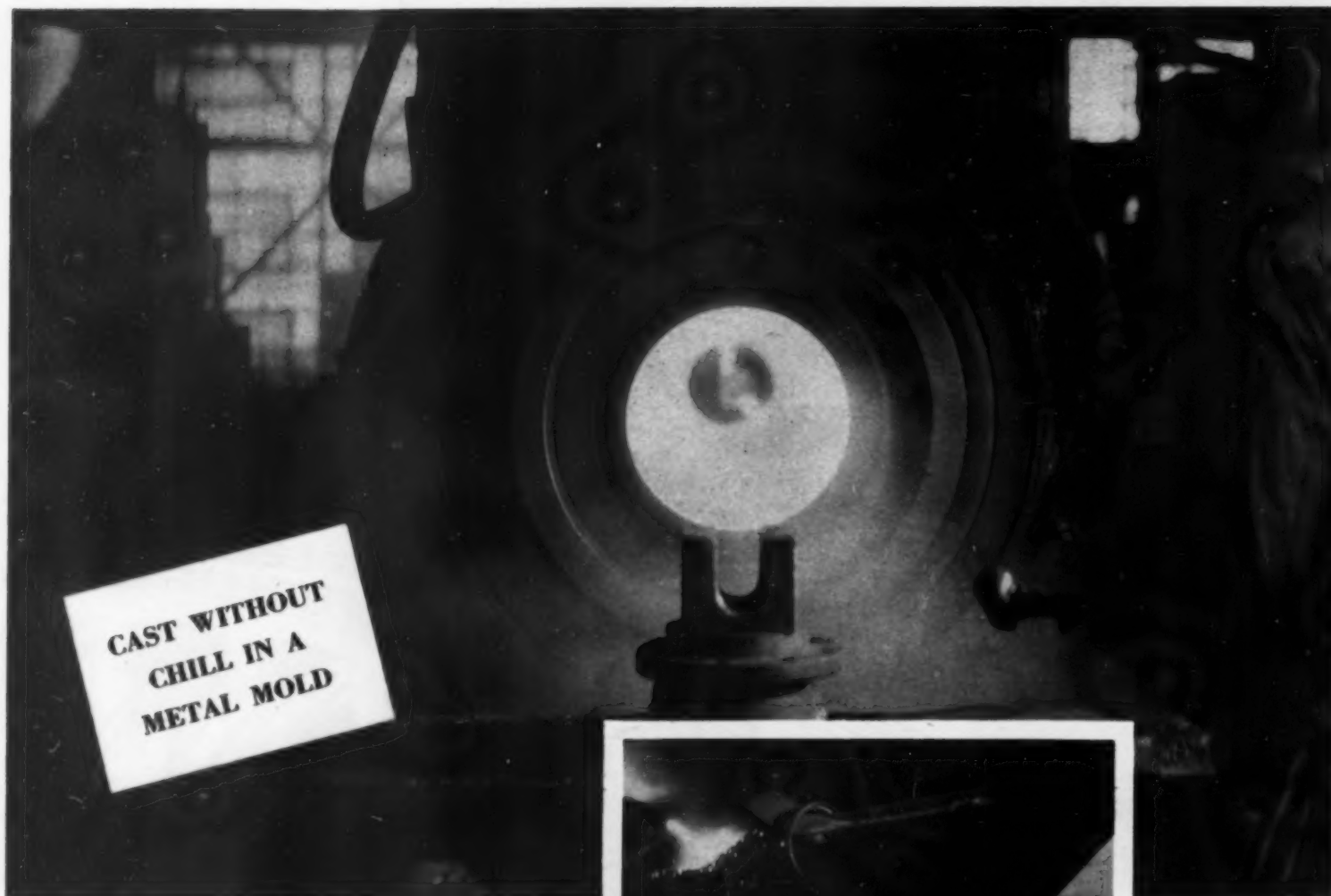
SHOVELS—CRANES—DRAGLINES  
LOCOMOTIVE CRANES—REVOLVERS



**GOPHER**

HOISTS—DERRICKS—PILE DRIVERS  
BLOCKS—SHEAVES

# impact strength **DOUBLED**



**CAST WITHOUT  
CHILL IN A  
METAL MOLD**

A patented improved process of centrifugal casting endows Super-de Lavaud pipe with physical characteristics which make this new pipe radically different from de Lavaud pipe as previously produced. There has been a fundamental metallurgical change in the metal structure. This new pipe is shatter-proofed to the extent that impact-resistance has been increased more than 100 per cent. When tested to destruction by hydrostatic pressure it does not shatter. It is a tougher, more ductile pipe capable of greater deformation without breakage. The factor of protection against handling hazards from plant to underground has been doubled. *Send for descriptive booklet.*

**UNITED STATES PIPE AND FOUNDRY CO.**  
**BURLINGTON, N. J.**

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Two years ago our research and technical staffs found a way to accomplish the "impossible." Super-de Lavaud Pipe is cast without chill in a metal mold. The product of this revolutionary process is an unchilled gray iron casting with extraordinary impact-resistance. The resultant metal structure fractures non-directionally counteracting fragmentation and permits a new annealing technique still further increasing impact-resistance.



## **U.S. SUPER-DE LAVAUD PIPE**





**S**HE'S a giant for her size, this Model 85—handles a 3 Cu. Yd. Bucket—yet gets around with a speed that only the Northwest Patented Crawler Base, with its positive traction at all times, could make possible—can be loaded and shipped on one standard flat car without major dismantling—brings you the cushion clutch, the "Feather-Touch" Clutch Control, the alloy steel boom, helical gear drive running in oil—all the advantages that Northwest has made famous and it can be equipped with the oil engine for greater economy.

#### NORTHWEST ENGINEERING COMPANY

*The world's largest exclusive builders of gasoline, oil and electric powered shovels, cranes and draglines*

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SHOVELS • CRANES • DRAGLINES • PULLSHOVELS • SKIMMER SCOOPS



# STABILITY-POWER-Speed

**T**HE Link-Belt is fast! It has POWER—ample power for generous speeds in all kinds of work. Speed and power go hand in hand. Backing up the Link-Belt's power and speed is a balanced design, a sturdy construction. That is why the Link-Belt performs so reliably, and "stands the gaff" in day-in-day-out hard service. From  $\frac{3}{4}$  to  $2\frac{1}{2}$  yds. capacity, heavy-duty built. Gasoline engine, Diesel or electric motor drive.

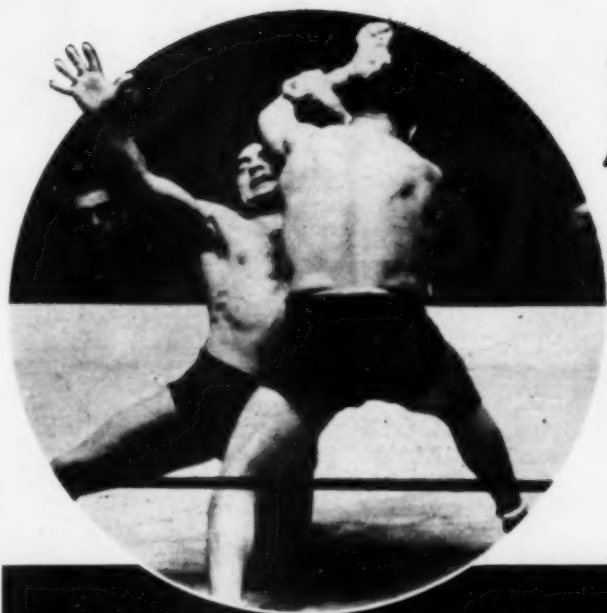
LINK-BELT COMPANY, 300 W. Pershing Road, Chicago

4054C

## LINK-BELT

SHOVEL-  
CRANE-  
DRAGLINE





# *The* WINNING FACTOR

In the Ring It's Training . . .  
On the Road It's Engineering



● Two wrestlers—strength, weight, and stamina about equal. What factor will make one of them the champion? Most effective use of power . . . The same with road machines. The same extra factor accounts for better performance. Between two equivalent machines, the skill of the engineering determines the winner.

● We dare say other Motor Graders are made of as good steel as that used in the Austin 77, and could be made with a power plant of equal horsepower. The extra ability in actual road work—grading, maintaining, ditching, scarifying, spreading oil mix and snow removal—comes from extra horsepower

combined with such features of design as these—Floating Drive (solid steel housings around shafts carrying the weight)—Chatter Proof Blade Bracing 60-inch Diameter Circle (blade arms and braces unit welded)—Lost Motion Prevented (ball and socket joints throughout)—Wide Front Axle Design (with Leaning Wheels).

● These are high spots only of complete functional design. Send the coupon for engineering details.

#### ● NOTE

Evidence of the Austin 77's leadership was given in the recent large road equipment purchase by an eastern highway department. Of 163 wheel type power graders purchased Austins took the largest single share (49), the remainder being divided among 6 manufacturers. In the heavy duty 4-wheel drive class, 57% of the business went to the Austin 77 Senior, while the runner-up got less than half this figure.

#### The Austin-Western Road Machinery Co.



Home Office: 400 N. Michigan Ave., Chicago, Ill.

Branches in Principal Cities

# Austin-Western

ROAD ROLLERS CRUSHING & SCREENING PLANTS SCARIFIERS  
SWEEPERS & SPRINKLERS ROAD GRADERS ELEVATING GRADERS



MOTOR GRADER  
DRAGS SHO

**The Austin-Western Road Machinery Co.**  
400 N. Michigan Ave., A-6, Chicago, Ill.  
Please send information on the Austin 77 Motor Grader.

Name  State   
Address   
City  LOCAL DISTRIBUTORS  
WAGONS SNOW PLOWS

not all  
*Crawler*  
tractors  
are  
**CLETRACS**

# ...but the easy starting "Diesel 80" is

Low fuel costs are fine and the Cletrac 80 Diesel gives you that. Low maintenance costs are fine; the Cletrac 80 Diesel also gives you that and — something more.

A new quick and easy, full electric starting system which cuts down lost time and gives you *more earning hours* each day the Cletrac 80 Diesel works. That's worth a lot—on one construction job where a test was recently made, a competitive tractor had nearly twice as much unproductive time as the Cletrac 80 Diesel. That meant more earnings for the Cletrac. See the Cletrac 80—world's most powerful automotive unit—either gasoline or diesel powered before you buy. Other models with horsepower rating of 55-35-25-20.

THE CLEVELAND TRACTOR COMPANY • CLEVELAND, OHIO

The Cletrac Model 80 Diesel with its quick and easy starting is saving time and money on the highways of this Oklahoma county.



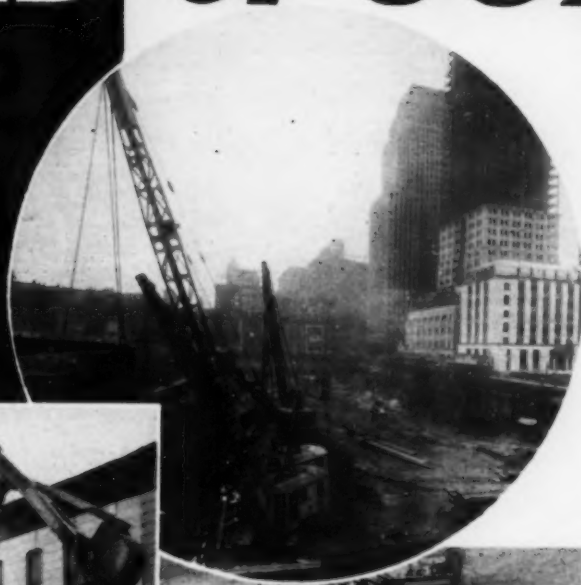
**Cletrac**

REG. U.S. PAT. OFF.  
**Crawler Tractors**

*Built To Endure*



# ON EVERY KIND of JOB-



the  
**EVIDENCE**  
SHOWS THAT -

## **P&H** SPLIT SECOND CONTROL

means greater operator efficiency . . . greater sustained yardage per hour, per day, or per month . . . more accurate hugging of a grade line . . . more economical spotting of a shovel . . . more of the smoothness of steam power.

## **P&H** SHOCK ABSORBER CONSTRUCTION

means lower upkeep expense . . . fewer breakdowns . . . less time lost . . . longer life and less depreciation.

## **P&H** SYNCHRONIZED SPEED

means less waste motion, hence greater economy in man-time and fuel consumption . . . faster digging cycles . . . quicker and surer dumping into trucks.

*split second*  
**CONTROL**

It's a treat to any man who knows shovels to see one of the new P&H machines at work. We'll be glad to show you one.

# **P&H**

## **HARNISCHFEGER CORP.**

*Established 1884*

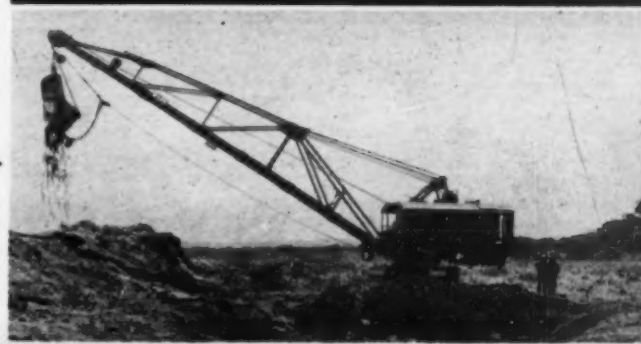
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*Warehouses and Service Stations:*

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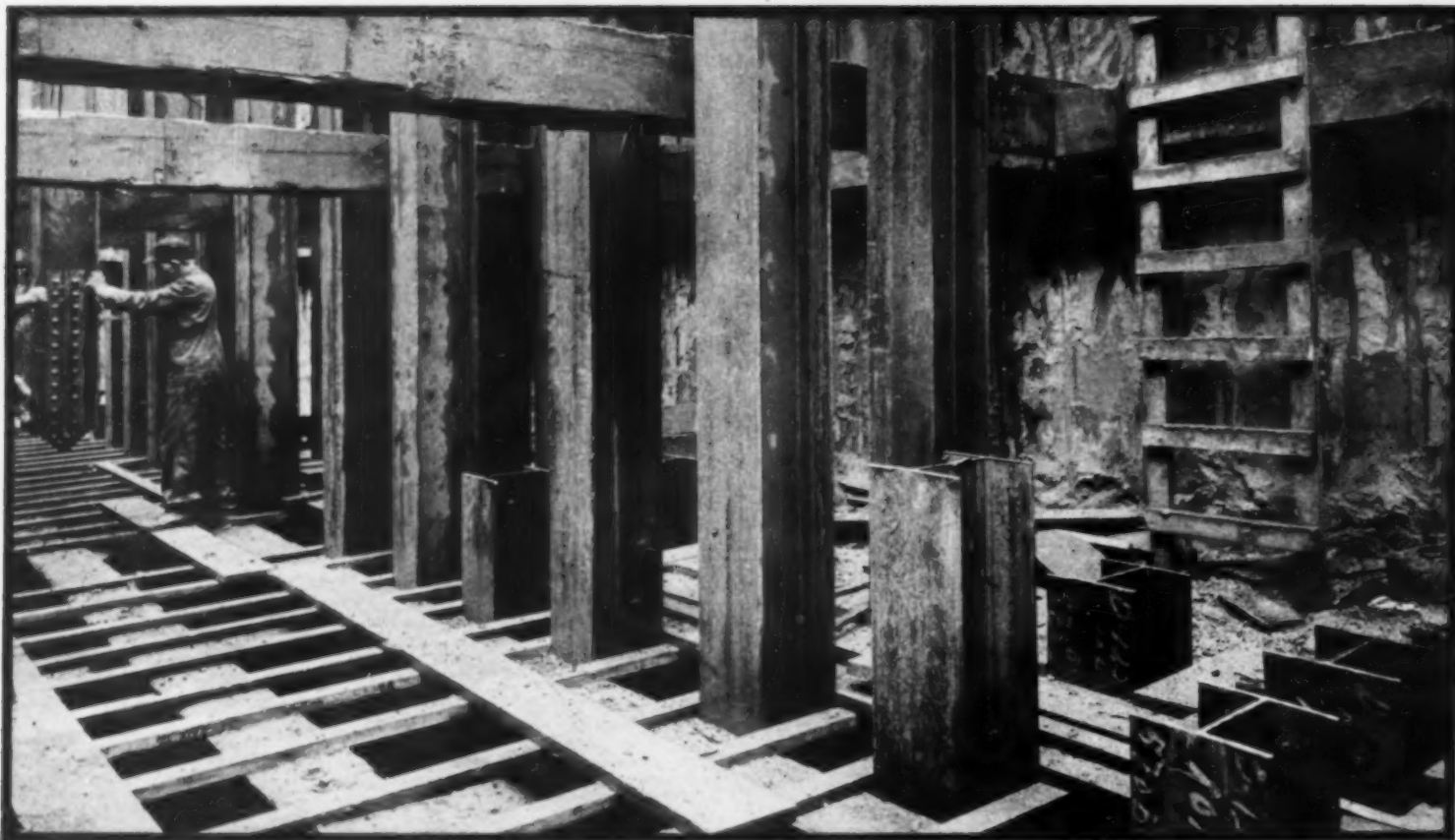
SAN FRANCISCO



# the 50<sup>th</sup> year



Excavators . . . Cranes . . . Hoists . . . Arc Welders



H-Beams as bearing piles under one pier of the Kansas River Highway Bridge at Kansas City, Kansas. Piles on this project were driven to refusal, in some cases at approximately seventy foot depths. Method of pointing and reinforcing the lower end of the H-pile is shown in the background. Note also the condition of the pile tops in the foreground—these have been driven. Kansas River Bridge built by Kansas State Highway Department. Designing Engineers: Sverdrup & Parcel. Contractors: Kansas City Bridge Co.

# For hard driving conditions

## C B S E C T I O N S

# as bearing-piles

Recent experiences prove that steel H-piles may be driven successfully into types of soil, gravel, or shale which present extremely difficult driving conditions. Thus bearing may be found well within substantial bottoms, rather than merely upon them. Lengths up to 90' have already been handled successfully and economically. Detailed information regarding experiences with H-piles may be had upon application.

### Illinois Steel Company

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 SOUTH LA SALLE STREET

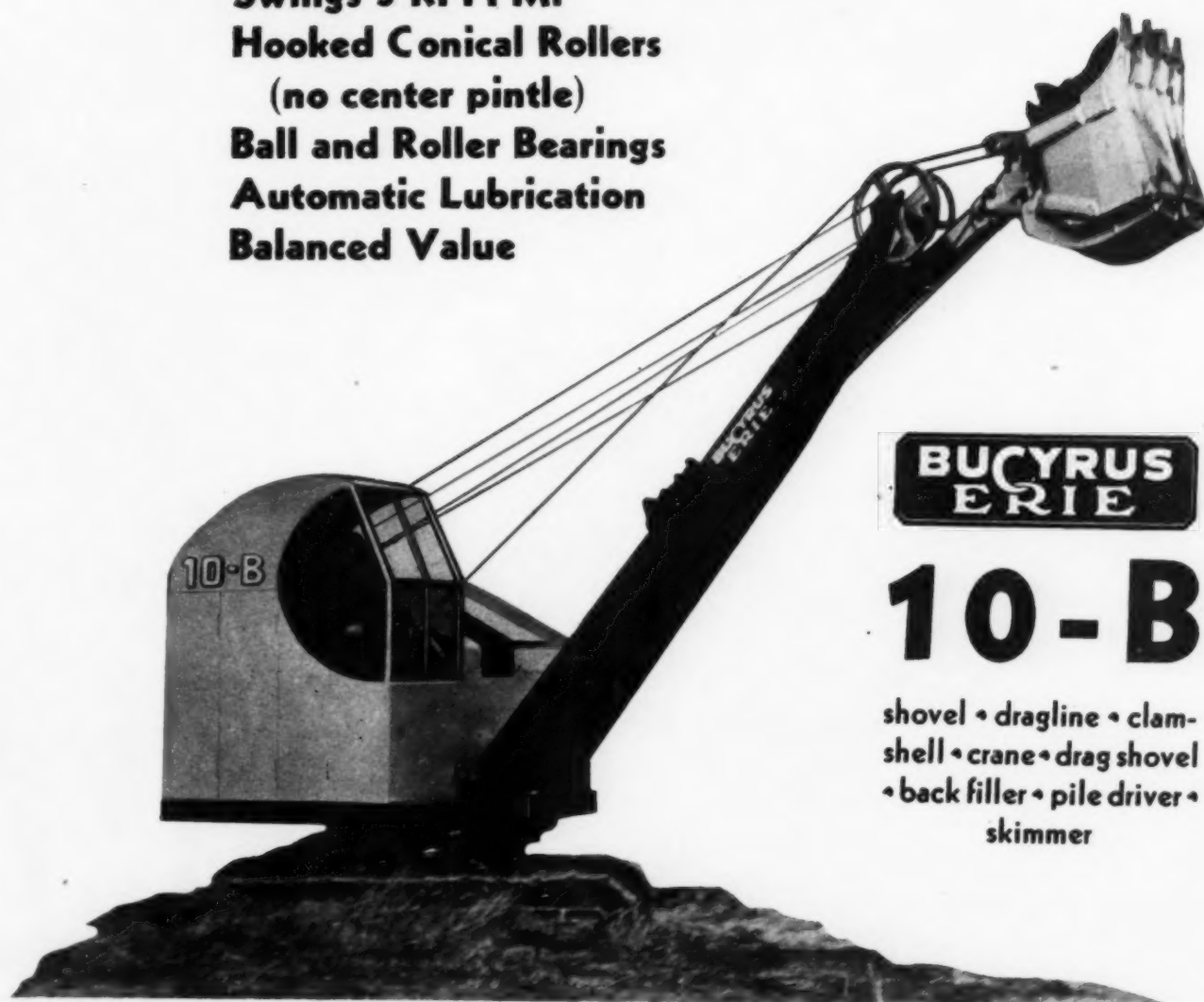


CHICAGO, ILLINOIS



# Startling New $3\frac{3}{8}$ -yard Performance

Full Revolving  
Weighs  $7\frac{1}{2}$  to 8 tons  
Travels  $4\frac{1}{4}$  miles per hour  
Steers like a tractor  
Power 35 to 52 H. P.  
Swings 5 R. P. M.  
Hooked Conical Rollers  
(no center pintle)  
Ball and Roller Bearings  
Automatic Lubrication  
Balanced Value



**BUCYRUS  
ERIE**

**10-B**

shovel • dragline • clam-  
shell • crane • drag shovel  
• back filler • pile driver •  
skimmer

744

## Bucyrus-Erie Company

GENERAL OFFICES: SOUTH MILWAUKEE, WIS., U. S. A.

## Performance Is Proof

Mr. Smith of the S. Smith Coal Company, Newark, N. J. in his letter emphasizes the extremely low upkeep of their LIMA Type 502. He also mentions the remarkable cable economy and the ability of the machine to raise or lower the boom while swinging.

These advantages which are characteristic of all LIMAS, are appreciated by crane users. Their modern design incorporates every worthwhile feature that will add to the efficiency and life of the machine.

### THE OHIO POWER SHOVEL CO.

DIVISION LIMA LOCOMOTIVE WORKS INCORPORATED  
HOME OFFICE LIMA, OHIO  
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S. SMITH COAL CO.  
SHIPPER  
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NEWARK, N. J.

CONE

The Ohio Power Shovel Company,  
Lima, Ohio  
Gentlemen:

February 7, 1934

We have received your letter of recent date asking whether we have any comments, favorable or unfavorable, to make on the operation of our 20-ton Lima 502 crane.

Since purchasing this machine about fifteen months ago, we have been using it with a 60' boom handling a 1-5/8 cubic yard Hayward bucket and every boatload of coal during this time has been unloaded in record time. Detailed figures on quantities unloaded in given periods, are available if you want them. Conditions here, are made necessary to frequently boom up and down with the machine swinging, and this I understand, is working bucket while the maximum load. If this is the case, then to my mind the most commendable feature about the machine, is its low upkeep. So far, my records show an expenditure of less than \$40.00 and that, I believe, was for one of the accessories on the machine. Also the cable bills, in comparison with those on my other machines which are handling smaller loads, convince me that the extra large drums and sheaves you feature are more than talking points. I will truthfully and gladly state that I am exceptionally well pleased with the Lima Crane and if you can find any use for this letter as a testimonial to that effect, you have my permission to use it.

Very truly yours,  
S. SMITH COAL CO.

*Samuel W. Smith*  
President

BE SURE  
THAT YOUR NEXT  
CRANE IS EQUIPPED  
WITH HELICAL GEARS,  
ANTI-FRICTION BEARINGS,  
INDEPENDENT MOTIONS,  
SELF-LOCKING BOOM HOIST  
DRUMS WITH LARGE DIAMETERS,  
BIG BOOM POINT SHEAVES,  
FAST LIVE BOOM,  
SQUARE LEVER SHAFTS

LIMA OFFERS YOU THESE  
FEATURES WITHOUT  
ADDITIONAL COST

MODERN • ECONOMICAL • LONG-LIVED



# LIMA

SHOVELS-DRAGLINES  
CRANES-BACKDIGGERS

CAPACITIES

SHOVELS . . . 3/4 YARD to 1 3/4 YARD  
CRANES . . . 12 TON to 30 TON



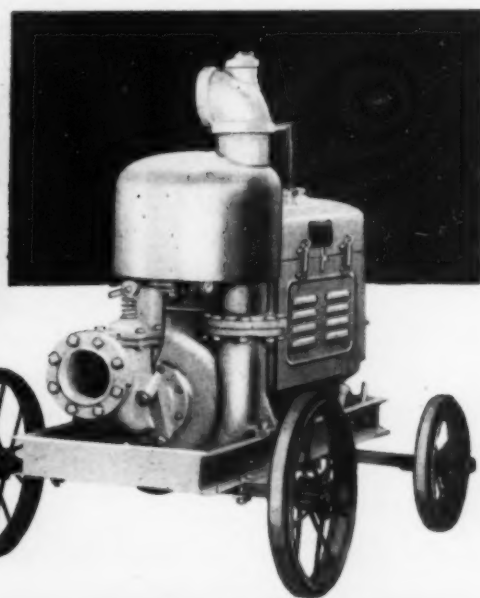
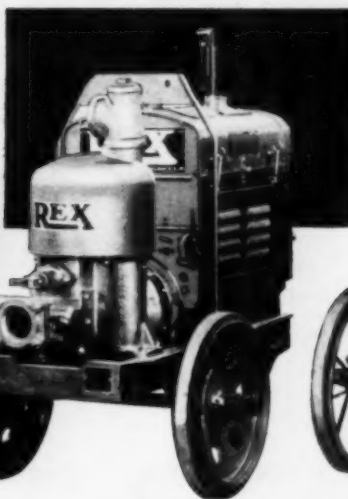
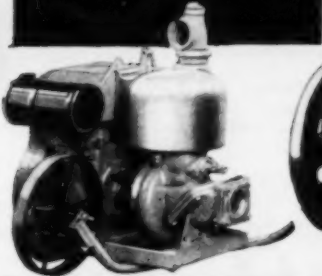
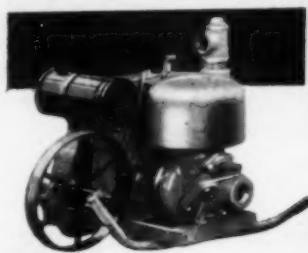


# YOUR LINE IS LEAKING AIR!

**NEVER MIND, OLD TOP—REX SPEED PRIME PUMPS CAN TAKE IT!**

Rex Speed Prime Pumps have the extra air handling capacity to handle water containing air in quantities that will stop any other centrifugal. Here are the reasons why. The patented "peeler," a steel blade set close to the impeller's path, actually cuts the air away from the impeller and rushes it out of the system . . . either when the pump is priming or when the suction line is leak-

ing air. It is found only on Rex Speed Prime Pumps. The Recirculation Cut-off stops the recirculation of water once the prime is established . . . saving power and maintaining the full capacity of the pump. If the prime is lost . . . the Rex Prime control automatically reprimers these pumps. They keep right on pumping when others stop.



**REX 2" SPEED PRIME PUMP**  
10,000 g.p.h.

**REX 3" SPEED PRIME PUMP**  
20,000 g.p.h.

**REX 4" SPEED PRIME PUMP**  
40,000 g.p.h.

**REX 6" SPEED PRIME PUMP**  
90,000 g.p.h.

**If you do dewatering, contracting, bridge, utility or industrial jobs . . . you need Rex Speed Prime Pumps. Mail the coupon for the New Folder "Man the Pumps!"**

Below—The Rex Road Pump—90 g.p.m. at 500 lbs.—125 g.p.m. at 320 lbs.—enough water and fast enough for any paver, plus sprinkling, plus curing.



## **REX SPEED PRIME PUMPS**

**CONTRACTORS: Before you buy—or bid—INVESTIGATE the Rex '49ers—the 49 complete machines for the contractor made by**

**CHAIN BELT COMPANY MILWAUKEE WISCONSIN**

Eastern Office: Room 529 Chrysler Building, New York City • Main Office: 1664 West Bruce Street, Milwaukee, Wis.  
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**CONSTRUCTION METHODS—June, 1934**

**CHAIN BELT COMPANY**  
1664 W. Bruce St.  
Milwaukee, Wisconsin

Please send me the Catalog—  
"Man the Pumps."

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# Select Any Texture of Stucco

Then bring out its full beauty  
with Atlas White portland cement



*Atlas White portland cement stucco was applied on the exterior of this monolithic concrete dairy building in San Antonio. Chris B. Christian was the stucco contractor. Atlee B. and Robert M. Ayres were the architects. Both of San Antonio.*

**F**or stucco in an English cottage texture for a residence, or in a float finish for an industrial building—in fact for any texture—it takes the right color to accentuate and bring out its full attractiveness.

Where the color needs to be light—in cream or tan or buff, or *any* light shade—or where the color needs to be bright—in green or yellow or blue, or *any* bright shade—or where it needs to be a clean crisp white, then white portland cement is the answer.

In its natural whiteness, or colored with

pigment to precisely the shade desired, white portland cement emphasizes and strengthens the stucco texture used, or softens and subdues it, according to the requirements of the exterior and its setting. And in any of the varied color and texture combinations possible, white portland cement stucco provides a durable, weather-proof, economical exterior finish.

Write for complete information to Universal Atlas Cement Co., *Subsidiary of United States Steel Corporation*, 208 South La Salle Street, Chicago.

## ATLAS WHITE PORTLAND CEMENT



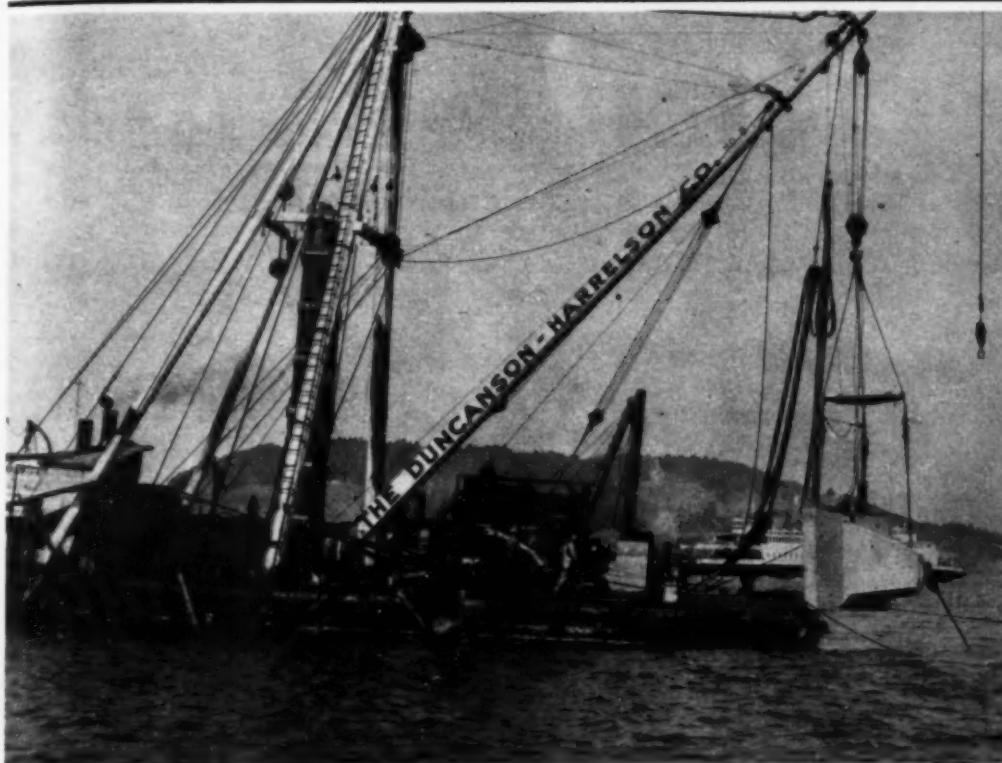
# Construction Methods



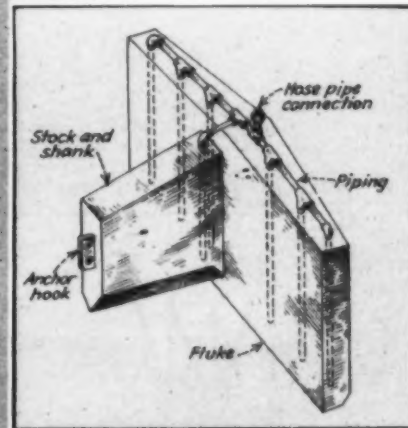
Established 1919—McGraw-Hill Publishing Company, Inc.

ROBERT K. TOMLIN, Editor

Volume 16—Number 6—New York, June, 1934



BARGES MOVE CONCRETE ANCHORS to exact locations as determined by transits from triangulation points. Floating derricks lower anchors.



JETTING NOZZLES at bottom edge of concrete anchor are used to jet T-shaped block into mud. Anchor is about 9 ft. high, and shank and flukes are about 8 ft. long by about 18 in. thick.

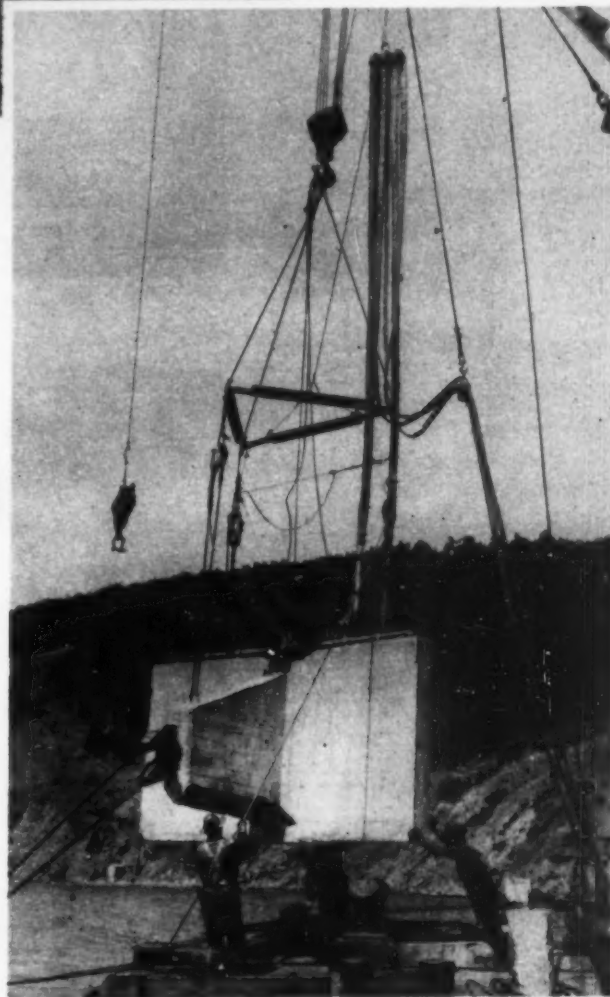
## T-Shaped Blocks *Anchor Bay Bridge Caissons*

**T**O HOLD the pier caissons of the West Channel crossing of the San Francisco-Oakland Bay Bridge in position against tidal currents of  $7\frac{1}{2}$  m.p.h., the Transbay Construction Co., contractor for the piers, devised a method of anchoring directly to the caissons during the sinking process using T-shaped anchors of precast concrete weighing 18 to 25 tons each, equipped with jetting nozzles along the lower edge. These nozzles are employed, after an anchor has been lowered to the bottom in exact position, to bury the T-shaped block.

Anchors are located about 300 ft. from the caissons, and tension in the anchor cables consequently is only slightly affected by a 6-ft. tidal range. A 2-in. bridge rope of

165-ton breaking strength, attached to each anchor, forms the main connection between the anchor and the caisson. Near the caisson, this heavy cable connects with an eight-part 1-in. line, the live end of which is reeved through a block attached to the caisson and thence parallel with the wall of the caisson to a hand winch above the water line. The winches are moved up on the caisson as sinking progresses.

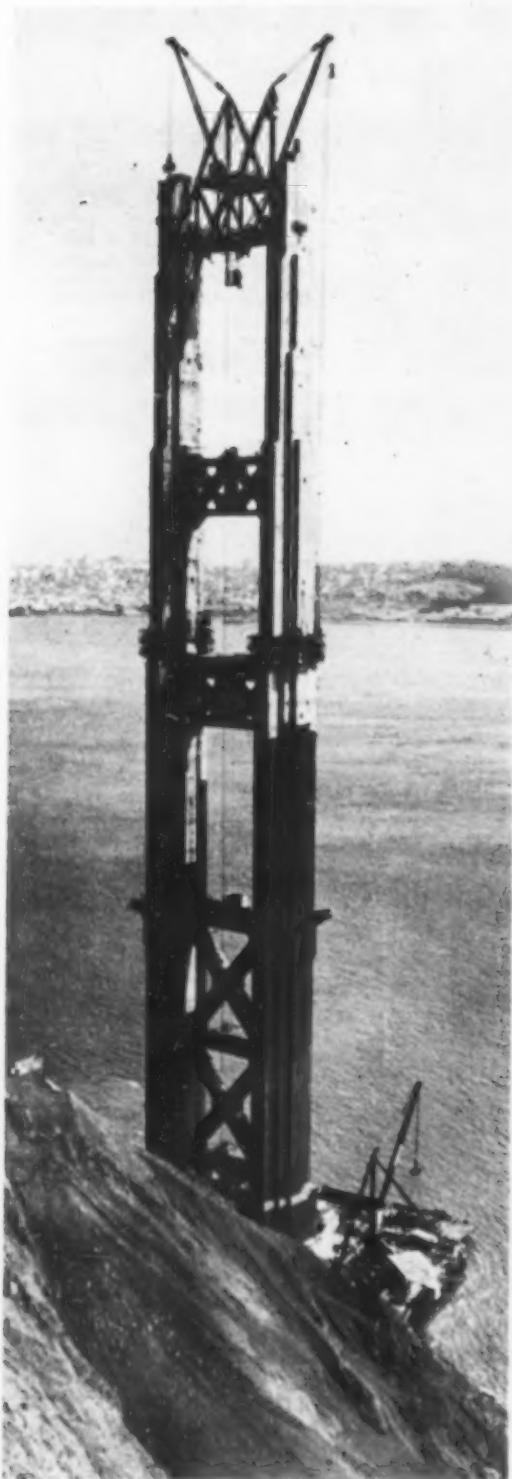
Four caissons, varying in plan dimensions from 92x197 ft. to 57x127 ft., are being sunk to rock at depths ranging from 125 to 220 ft. for piers 3 to 6, inclusive, of the West Channel crossing. A minimum of eight anchors is used at pier 3, and a maximum of 26 at pier 4, the largest pier.



PRECAST T-SHAPED CONCRETE BLOCK suspended at three points is lowered to bottom. Hose attached to jetting system will supply pressure streams of water to bury anchor in mud. Two anchor cables attached to stock will connect with caisson at two points.

# This Month's "NEWS REEL"

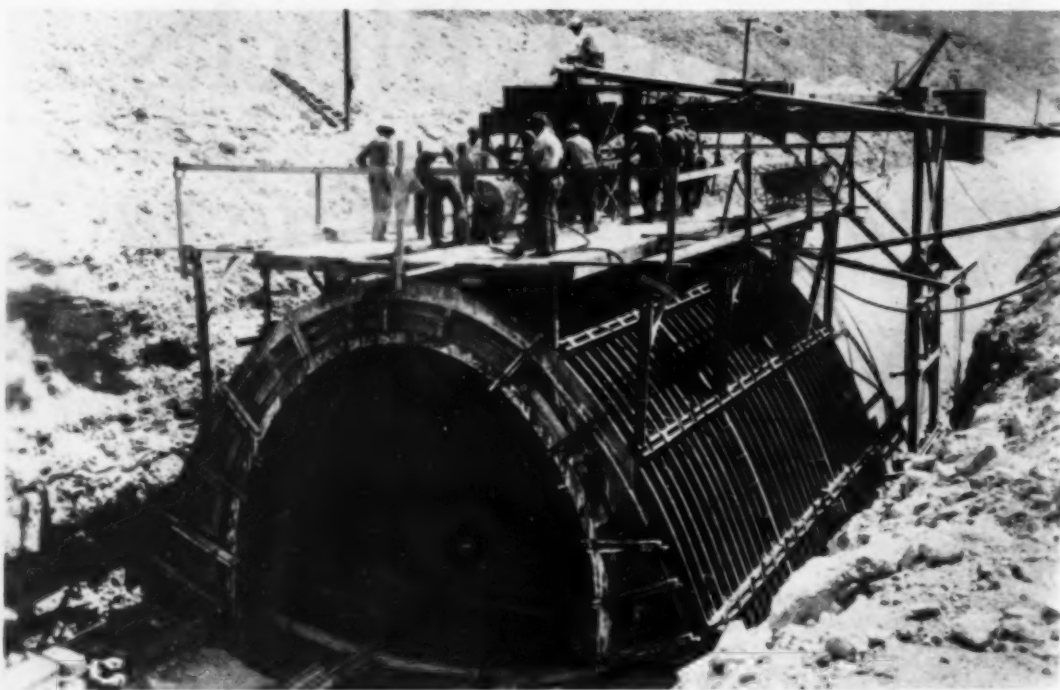
LAST COLUMN SECTION (*below*) is placed by McClintic-Marshall Corp. in Marin tower for San Francisco's 4,200-ft. span Golden Gate suspension bridge, bringing tower height to 736 ft. Subsequent placing of cable saddles will complete 750-ft. steel structure for Golden Gate Bridge and Highway District.



MIDTOWN HUDSON VEHICLE TUNNEL between New York and New Jersey, for which \$6,452,000 contract for under-river portion of south tube, with external diameter of 31 ft., was recently awarded to Mason & Hanger Co., Inc., of New York is scene of ground-breaking ceremonies along riverfront May 17, with Mayor La Guardia broadcasting address. The project, to include a second tube, plazas and highway connections, is being directed by the Port of New York Authority, O. H. Ammann, chief engineer, under a PWA loan of \$37,500,000.



HUGE EARTH FILL, amounting to 300,000 cu. yd., is placed by Los Angeles Bureau of Water against downstream face of 200-ft. high Mulholland concrete dam as safety gesture demanded by citizens of Hollywood, in spite of engineering opinion declaring dam to be safe.



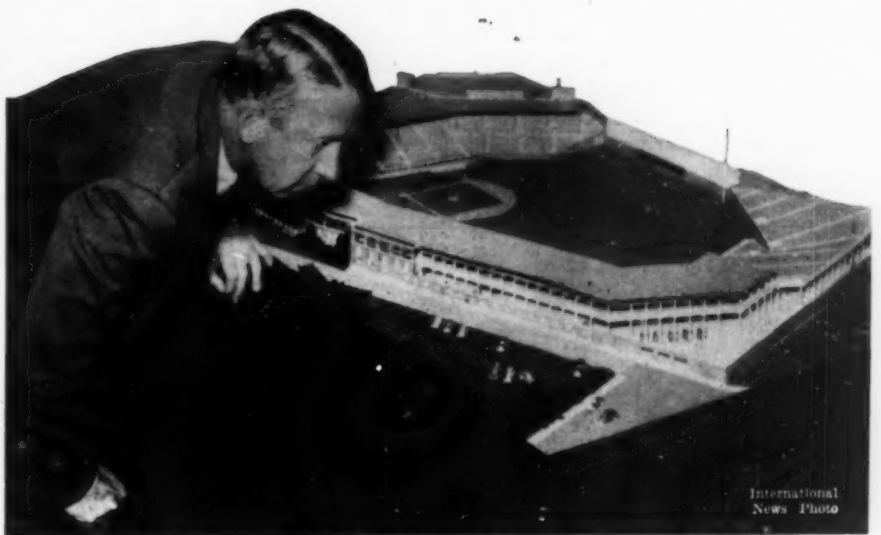
FAN HILL SIPHON, in Little San Bernardino Mountain area, is scene of pouring of first concrete on the 241-mi. long Colorado River aqueduct, being built by Metropolitan Water District of Southern California. On this project M. Hjalmarson is construction superintendent, under R. B. Diemer, division engineer. The present work, involving a 700-ft. length, is experimental, to determine relative merits of monolithic and precast construction for a total of 150 siphons on the aqueduct line. Conduit section is 16 ft. high and 19 ft. wide, inside.



**RODRIGUEZ DAM** (*right*), being constructed on Tijuana River by Ambursen Dam Co., for Mexican Government, is highest of its type built to date, extending 187 ft. above streambed. Length of dam along crest is about 2,000 ft. Concrete, involving a total of about 200,000 cu. yd., was placed by five 1,000-ft. cableways. Buttresses supporting concrete deck are spaced 22 ft. center to center.



**TWIN LAKES TUNNEL** (*below*), through Continental Divide, to divert irrigation water from west to east slopes of Colorado, is under construction by Platt Rogers, Inc., general contractor, of Pueblo. Contract at \$1,125,000 includes 3.8 mi. of 9-ft. 2½-in. bore and 1.75 mi. of 8-ft. 2½-in. bore.



International News Photo

**BALL PARK REBUILT** at cost exceeding million dollars. Model of new grandstands and diamond at Fenway Park, home of Boston Red Sox, is inspected, by Manager Eddie Collins, regarded as greatest second-baseman of all time.



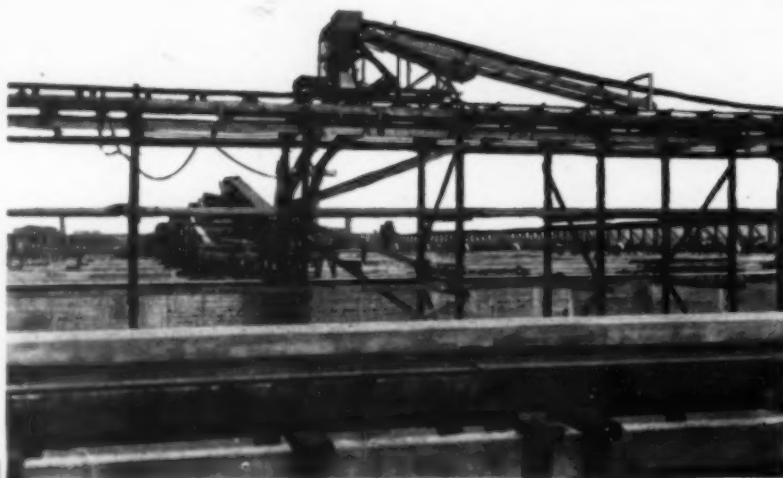
**SLUM DEMOLITION** starts in New York City when Langdon W. Post, Tenement House Commissioner, razes section of brick wall on one of a group of old buildings on East 18th St., condemned as fire traps.

# BELT CONVEYORS

*Distribute Concrete for 30-Acre*

## WARD'S ISLAND SEWAGE PLANT

A SYSTEM of four long belt conveyors delivered from a central mixing plant to distribution hoppers or to portable conveyor trains 83,000 yd. of a total of 107,000 yd. of concrete required by the Ward's Island sewage-treatment plant in the East River, completed last year by the Department of Sanitation of the City of New York as the first unit in a comprehensive program to reduce pollution in waters surrounding the city.



largely determined the concrete subcontractor's choice of construction plant. Starting excavation in July, 1931, the general contractor had the work sufficiently advanced to permit placing of the first concrete by Oct. 6. The Turner Construction Co. planned: (1) to complete before the following summer all concrete structures necessary for the installation of its large-capacity distribution system, and (2) to push the main volume of concrete construction



TRIP (top) on one of two main branch conveyors delivers concrete through chute to train of portable conveyors.

TRAIN OF PORTABLE CONVEYORS supported on wood towers distributes concrete to floors and walls of aeration tanks.

Space restrictions at the site, which is closely bounded on two sides by the elevated viaduct of the New York Connecting R.R. and on the other two sides by the waters of Hell Gate and Little Hell Gate, combined with the necessity of providing a flexible system of large capacity to deliver to numerous locations each day, led the Turner Construction Co., subcontractor on all concrete work under W. H. Gahagan, Inc., general contractor, to devise a distribution scheme utilizing chiefly fixed and portable belt conveyors but incorporating, as well, truck mixers operated as agitators.

**Sewage Treatment Plant**—Designed for a capacity of 180 m.g.d., the Ward's Island plant, of the activated-sludge type, occupies an area of 30 acres and consists of three main elements—the preliminary settling tanks, the aeration tanks, and the final settling tanks. In addition to these elements, the contract included the foundations for four preliminary sludge-pumping stations and two return sludge-pumping stations, with all necessary conduits and piping between the structures and within them.

Utilization of the plant has been postponed by the current financial stringency, which has prevented the letting of contracts for the construction of collecting sewers and interceptors in the boroughs of Manhattan and the Bronx and of a subaqueous conduit to convey the sewage under Little Hell Gate to Ward's Island. The plant is intended to treat sewage from upper Manhattan and the lower Bronx.

**Construction Program**—Decision to follow a plan of rapid construction

during about 6 months of good weather, completing the project far ahead of schedule and saving the expense of continuing operations through a second winter.

This program called for daily concrete production averaging about 800 yd. through the summer months and necessitated the design of a fast, flexible and reliable concrete-placing system. In view of this requirement and of the physical characteristics of the site, as indicated by the accompanying plan, the subcontractor determined to use a main distributing system of fixed belt conveyors delivering at a number





CONVEYOR SYSTEM delivers concrete through transfer points and train of portable conveyors to final destination in walls of aeration tanks.

of points into portable units, either belt conveyors or truck agitators. The program required that the winter construction be completed in time for installation of the conveyors.

**Preliminary Work**—Excavation involved the removal of about 400,000 yd., of which 72,000 yd. was rock. All of the concrete structures except battery A of the aeration tanks rest on natural soil. At battery A the excavators cut a foot or two below grade into rock and placed a cushion of earth to carry the concrete footings and floor slabs.

As rapidly as general excavation permitted, the contractor began to dig trenches for the installation of cast-iron pipe, under-drains and concrete conduits. It was necessary to complete during the winter the large-diameter concrete conduits which lie, respectively, between batteries A and B and between batteries C and D of the aeration tanks, as the subcontractor intended to erect over these structures timber trestles to carry fixed belt conveyors. It likewise was important that the operating galleries at the east end of batteries B and C be completed in time to support a third long belt conveyor.

Concrete for all this preliminary work, aggregating 23,000 yd., was supplied from a temporary mixing plant erected by the subcontractor on an old wharf on the riverfront. A separate contract calling for construction of a new wharf along this frontage was in process of construction at the same time by the Frederick Snare Corp. The main mixing plant could not be installed until a section of the new wharf was completed, and the temporary plant functioned in the interval, supplying concrete for the preliminary work.

At the temporary plant a Northwest gasoline crawler crane transferred sand and gravel from barges into elevated bins on the dock. The material passed



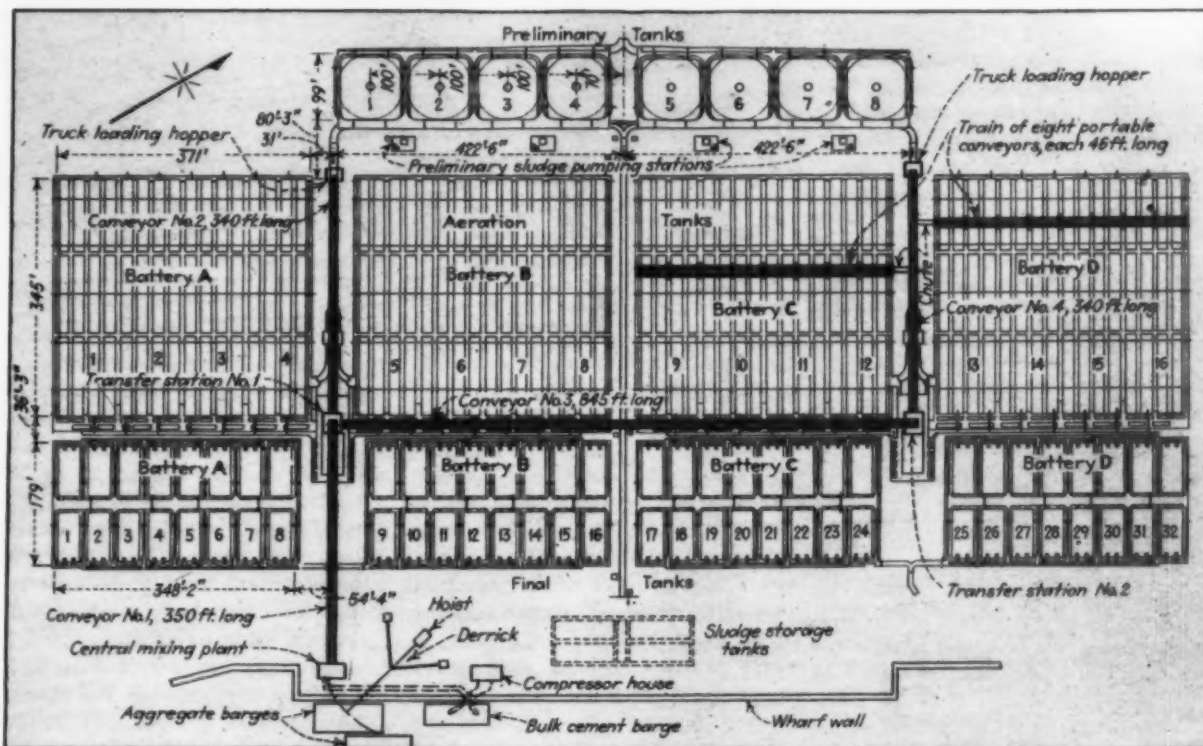
CHUTE from trip on one of two main lateral conveyors discharges concrete into boot of first unit of portable train. In background, second train of portable conveyors is delivering concrete from other main lateral conveyor to adjacent battery of aeration tanks.



TRUCK MIXERS operating as agitators deliver large loads of ready-mixed concrete from truck-loading hoppers to outlying structures with aid of portable belt-conveyor elevators.

by gravity from these bins through batching hoppers into a 1-yd. mixer which discharged upon a belt conveyor. This conveyor elevated the concrete to a 10-yd. hopper from which truck mixers operating as agitators, distributed the concrete to various points on the job. These trucks placed concrete in structures below the level of the ground directly through chutes and delivered the concrete for walls and other superstructure elements to portable gasoline-powered Barber-Greene elevating belt conveyors.

Major Construction Operations —



FLEXIBLE AND FAST DISTRIBUTION for 83,000 cu. yd. of concrete on 30-acre plot is provided by system of fixed and portable belt conveyors. Waterside mixing plant supplied with aggregates and bulk cement by barges discharges concrete directly into boot of first main conveyor.

Following construction of a section of the new wharf and of the prerequisite concrete structures, the subcontractor installed the main mixing plant and the system of four fixed belt conveyors. As shown on the plan already referred to, this system had two transfer stations and could deliver to distribution hoppers at four widely separated points. Conveyor No. 1 (350 ft. long) carried the concrete from the mixing plant up

system was transferred from the main belts to position for placing by trains of portable belt conveyors installed on mobile platform towers which traveled on the concrete channel floors between the walls of the aeration tanks.

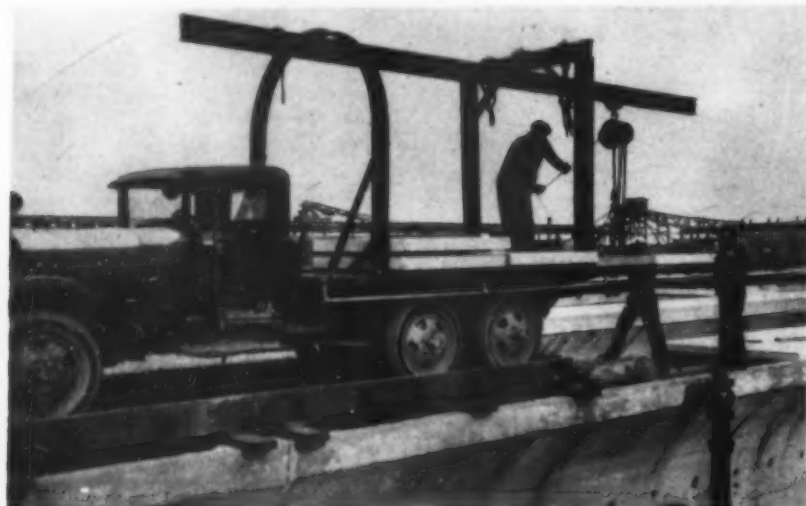
During the construction of batteries A and B, two trains of portable belt conveyors, consisting of eight units in each train, operated on opposite sides of main conveyor No. 2, alternating

made 46 ft. long to locate the discharge ends of successive conveyors over every second wall. All the portable conveyors were Barber-Greene units driven by 7½-hp. electric motors. Belt speed of first conveyor in a train was 500 ft. per minute; the rest of the belts traveled 400 ft. per minute.

Walls of the aeration tanks were 17 ft. high above the floor slabs. To permit chuting into wall forms at a distance

a desire to save rehandling expense, the contractor determined to unload all concrete materials directly from barges to the mixing plant. Handling equipment of large capacity was installed at the wharf to maintain an adequate supply.

Bulk cement, shipped to the site in Lehigh Cement Co. barges of 2,200- and 2,500-bbl. capacity, was unloaded by two Fuller-Kinyon conveying systems, one delivering to the cement bin



**MOTOR TRUCK EQUIPPED WITH TROLLEY HOIST** transports and places precast concrete slabs which cover troughs of intermediate walls of aeration tanks. These troughs contain compressed-air pipe lines for aeration of sewage.

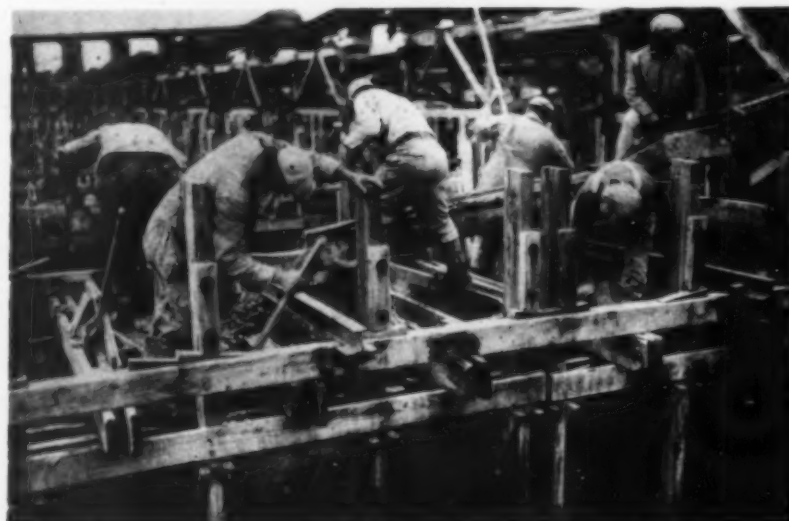


**PRECAST 4-IN. SLABS** to cover troughs in intermediate walls are cast in yard with capacity of 35 slabs per day. Electric gantry crane raises slabs from forms and stacks them in piles from which they will be picked up by truck-mounted trolley-beam hoist.

an incline of varying slope (the maximum inclination being about 20 deg.) to a height of about 24 ft. At station No. 1 the stream of concrete could be carried straight ahead by conveyor No. 2, could be diverted partly or entirely to conveyor No. 3, or could be discharged into an 8-yd. hopper which fed truck mixers. Conveyor No. 2 (340 ft. long) delivered at its terminal to an 8-yd. hopper for loading agitator trucks. Conveyor No. 3 (845 ft. long) transported concrete north to transfer station No. 2, where the material was transferred to conveyor No. 4 (340 ft. long) or was turned into a third truck-loading hopper. The fourth distribution hopper for truck agitators was located at the western terminal of conveyor No. 4.

All the conveyors had belts 24-in. wide driven by General Electric motors. The belt of conveyor No. 1 traveled 500 ft. per minute and the operating speed of the other three conveyors was 400 ft. per minute. Each of the three shorter conveyors was driven by a 35-hp. electric motor. During most of the work, a 50-hp. electric motor operated conveyor No. 3, but, in the last stages of construction, this motor was replaced with a 75-hp. unit.

Of the total volume of 83,000 yd. of concrete carried by the belt-conveyor system from the main mixing plant, 33,000 yd. was delivered to the distribution hoppers for further transportation by the truck agitators to the preliminary tanks, final tanks or other structures. Nearly all the rest of the concrete transported by the conveyor



**CONCRETE FOR 68-FT. WALL SECTION** is distributed by duralumin chutes from end of portable conveyor resting on tower platform 8½ ft. above top of wall. Wall requires more than 1 cu. yd. per linear foot.

distribution day by day between the two batteries and leaving the intervening days for the hardening of concrete and the moving of forms. This method of distribution was repeated for batteries C and D, the two trains of portable belt conveyors operating on opposite sides of conveyor No. 4. Each of main conveyors Nos. 2 and 4 was equipped with a rolling tripper which could pass the entire volume of concrete forward on the main conveyor, could divert it wholly to either of the aeration batteries, or could divide the stream in two, or three directions.

Dividing walls of the aeration tanks were spaced about 23 ft., c. to c., and the portable belt conveyor units were

from the portable belt conveyors, the tower platforms supporting these units were made 25½ ft. high. The platforms, 16x12 ft. in area, were supported on eight 4x6-in. posts, four at each side, bolted at the bottom to double 3x12-in. girders between which turned 24-in.-diameter welded bushed wheels. The bottom horizontal strut of the transverse tower bracing could be removed to permit trucks carrying wall forms to drive through the towers. Wood runway panels 3 ft. 6 in. wide bridged the gaps between the towers.

**Concrete Mixing Plant**—As Ward's Island can be reached only by water, all materials had to be delivered in barges. Because of the lack of storage space and

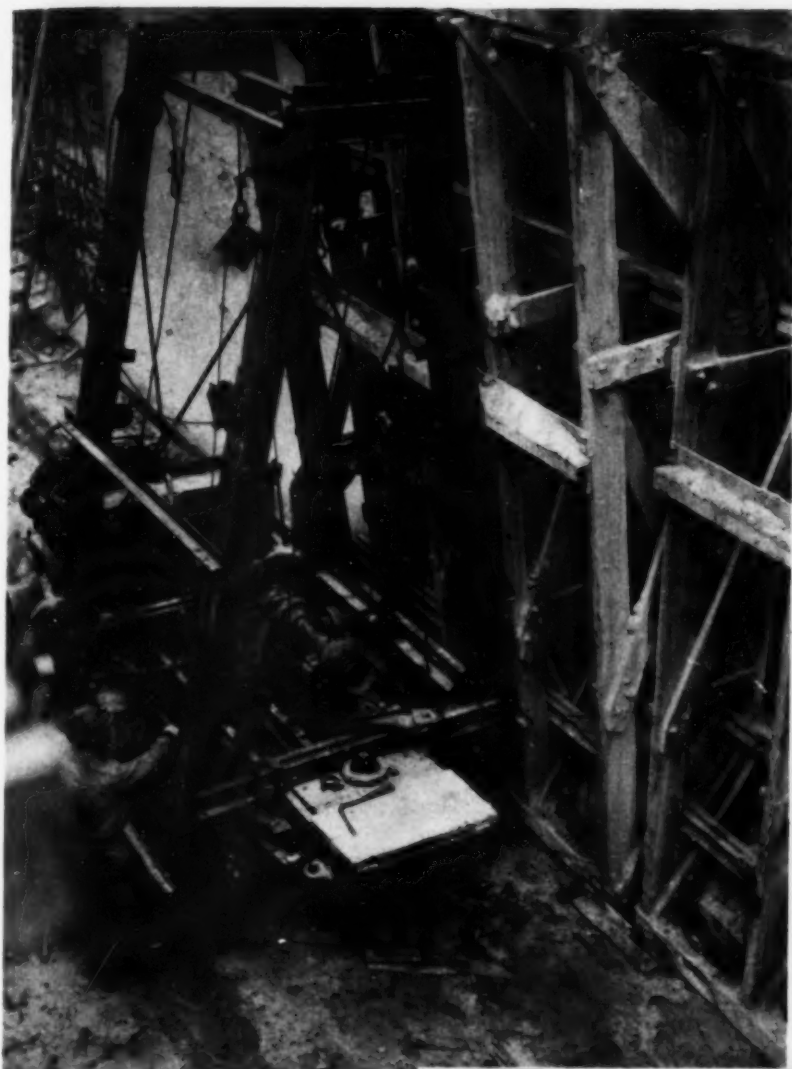
of the mixing plant through a 3-in. pipe and the other through a 4-in. pipe. Each pipe line was fed cement by a one-man unloading machine and was supplied with air at a pressure of 55 to 60 lb. by a rotary compressor with a capacity of 256 cu. ft. per minute, operated by a Westinghouse 50-hp. motor. The two conveying systems were capable of unloading in one day the 1,800 bbl. of cement required for a concrete volume of 1,200 yd.

An American Hoist & Derrick Co. stiff-leg derrick of unusually long operating radius and high speed handled sand and gravel in a Hayward 2-yd. clamshell bucket from the barges to 125-yd. Butler steel bins. The boom-hoist, bucket-closing and load lines of this derrick were operated by a single-speed 3-drum hoist equipped with friction clutches and driven by a 150-hp. electric motor. A two-drum hoist engine powered by a 35-hp. electric motor operated the swinging motion.

Bins of the mixing plant had a capacity sufficient for about one hour's supply of aggregate and about three hours' supply of cement when the plant was operating at maximum output. Measured quantities of materials were discharged from batchers into a hopper which fed either of two Ransome 1½-yd. mixers. Cement was metered in a Fuller-Kinyon automatic weigh batcher, and sand and gravel were batched by volume. Both mixers discharged into a 5-yd. hopper which fed conveyor No. 1.

**Aeration Tank Walls**—Surfaces of the dividing walls of the aeration tanks are curved to impart a spiral motion to





**WALL FORM SECTION** 11 ft. 8 in. long and 17 ft. high, weighing 2½ tons, is picked up by special steel frame and geared hand hoist mounted on truck. Forms are re-used 40 times.



**HEAVY TIMBER WALL FORMS** are faced with 20-gage steel plate backed by 3-in. lagging. Double steel channels on backs of forms serve as wales for tiebolts and for turnbuckle hold-down rods attached to anchor bolts cast in the footing concrete.

the flow of sewage. In cross section each wall is shaped something like a Y, with a solid base resting on a spread footing and a V-shaped trough in the top covered by a concrete slab. The walls, which are 5 ft. thick at the base and 7 ft. wide at the top, with a straight vertical section 12 in. thick between the curved bottom and top portions, required more than 1 yd. of concrete per linear foot. Troughs of the intermediate walls carry compressed-air pipelines for the aeration of sewage; these troughs are covered by 4-in. precast concrete slabs which can be removed for inspection and repair of the pipes. Troughs in the other walls are covered with 6-in. slabs cast in place.

Expansion joints running through the batteries in north and south direction divide the aeration tanks into four 68-ft. sections and two 34-ft. end sections. The sections had to be concreted separately, and the necessity of letting one day intervene between the concreting of adjacent sections was a factor in determining the contractor's plan to place concrete in adjoining batteries alternately. When constructing walls, the program called for the concreting each day of half of the number of tank walls in a 68-ft. section of one battery and for an equal volume of concreting in



**STEEL BED PLATES** for wall forms are placed over anchor bolts cast in concrete and are adjusted for grade. Wood wedges are driven between base of wall form and riveted angle at back of bed plate to prevent spreading of forms at bottom of wall.

the adjacent battery on the following day. Forms in each battery were moved to the next section in the intervening day.

Sufficient wall forms to carry out this program were constructed in sections 11 ft. 8 in. long (six sections being sufficient to pour the 68-ft. length of wall between expansion joints) and were sturdily built to withstand the hard usage entailed in being moved and filled 40 times. The surface of the form consisted of 3-in. lagging faced with 20-gage steel plate; the lagging was attached to heavily braced timber struts cut by templet to the proper contour of the wall surface. A steel angle was

bolted to the back of the form section, which weighed more than 2½ tons, to enable it to be picked up and moved forward by a special steel frame and Foote geared hand-hoist rig mounted on an Autocar 5-ton truck. Four of these trucks were equipped to move wall forms.

Anchor bolts for the wall forms were cast in the footing concrete. Four bolts were used for each section, one at each end of the form and two in the center. To prevent the forms from spreading at the bottom and to provide a level surface for the base of the forms, the contractor designed steel plates, with riveted angles attached, which were placed

over the anchor bolts, as shown by one of the photographs. Turnbuckle hold-down rods were attached to the anchor bolts, and wood wedges were driven between the bottom of the wall forms and the steel angles of the base plates to lock the form securely in position. Double steel channels were incorporated in the form unit to serve as wales for tiebolts and for the hold-down rods.

Placing of concrete in the floors and walls of the aeration tanks from the trains of portable conveyors entailed frequent moves of chute lines. The contractor found it economical to conserve labor by investing in light chutes of duralumin for this work.

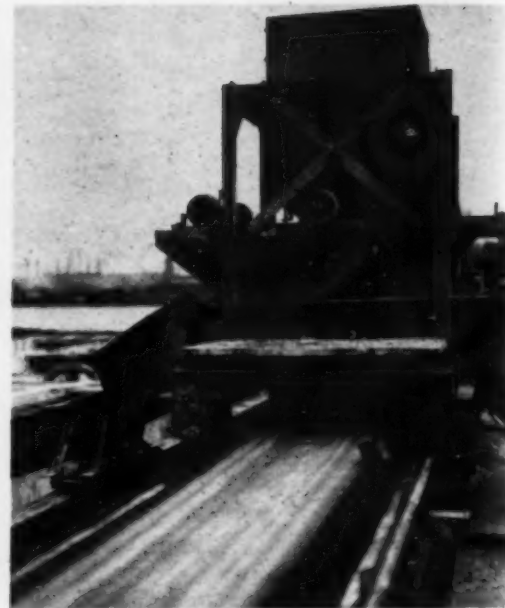
**Sequence of Operations**—In preparation for concreting the aeration tanks, the contractor built by truck mixers the west section of floor slab from the west wall to the first expansion joint. On this slab, the concreting crew erected the rolling towers and the series of eight 46-ft. belt conveyors. Proceeding east from this section and pouring the floor slabs of successive sections in advance, the conveyor train completed the floors to the east wall. On its return pass to the west, the conveyor train placed the wall concrete in half of the battery. Before placing the concrete in the rest of the walls, the conveyor train



**TROUGH** in aeration tank wall is formed by special trough section resting on wall forms. Note concrete washers for spacing steel and trough form.



**ROLLING WOOD TOWERS** traveling on concrete channel floor support units of portable conveyor train delivering concrete to wall forms.



**THREE-WAY TRIP** on main lateral conveyor can be adjusted by moving small rolling hopper to pass concrete in one, two, or three directions.

was returned to the east side of the battery, and the remaining walls then were concreted on a second pass from east to west. Cast-in-place slabs covering the troughs of alternate walls were concreted before the conveyor train was removed from the battery.

Concrete in the west section of the final tanks was placed by chute from main conveyor No. 3 or from portable conveyor trains next to the east walls of aeration tank batteries A and D. The rest of the concrete in the final tanks and all the concrete in the preliminary tanks was transported by truck-mixers and placed either directly from the trucks or by means of elevating belt conveyors.

**Truck Agitators**—From one to four Rex 3-yd. truck mixers operated each day as agitators, delivering 5-yd. loads of concrete from the distribution hoppers to structures beyond the reach of the conveyor system. Concrete to be placed above ground level was delivered by the trucks to portable gasoline-powered belt conveyors which elevated the material into the forms. Four of these portable units, each about 50 ft. long, operated at angles up to 45 deg.

**Construction Speed**—During the period of rapid construction, the concrete plant placed as much as 1,200 yd. in one 10-hr. day and 6,000 yd. in one 6-day week.

**Precast Slabs**—Precast concrete slabs

for the troughs of intermediate walls were manufactured by the concrete subcontractor in a yard at the northwest corner of the project, where flat bed forms for 70 slabs were laid out on the ground. About 35 slabs per day were cast in these forms with concrete delivered by truck mixers and distributed from the mixers to the forms by chutes equipped with line gates. A 1-ton-capacity electric gantry crane spanning the slab yard removed the cast slabs from the forms and placed them in stock piles. The general contractor picked up the slabs from these piles, transported them to the aeration tanks and placed them over the wall troughs with a motor truck equipped with a

trolley beam hoist.

Precast concrete slabs containing diffuser plates to be placed in the bottoms of the aeration tanks were cast by the general contractor in steel forms on the floor of the tanks. Concrete for these slabs was delivered by a 1½-yd. truck mixer running on top of the aeration tank walls. Chutes delivered the concrete from the truck mixer to a rolling hopper on the floor. From this hopper the concrete passed through another chute to the slab forms, which were placed within convenient distance of the final location of the slabs. A manually operated rolling gantry hoist picked up the slabs and placed them in final position.



**PRECAST CONCRETE SLABS** to be placed in bottom of aeration tanks are cast on floor in steel forms. Truck mixer running on plank rails on top of tank walls delivers concrete.



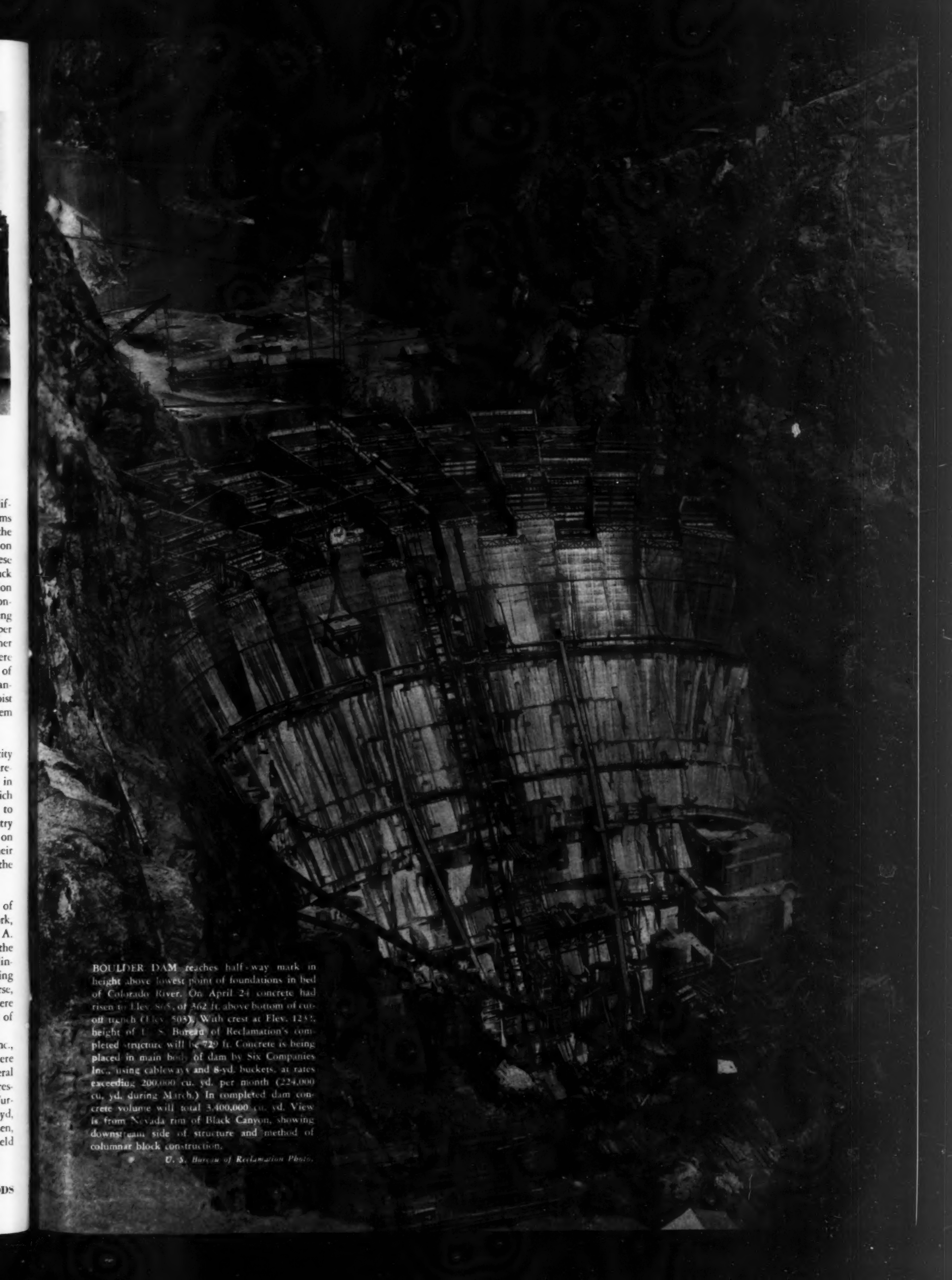
**ROLLING GANTRY HOIST**, operated by hand, picks up precast concrete slabs (containing diffuser plates) and places them in final position in bottom of aeration tank channel.

**Reinforcing Steel**—A total quantity of 6,500 tons of reinforcing steel required by the project was received in barge lots of 400 to 500 tons which were transferred in 15-ton bundles to bolsters on shore. A Willamette gantry hoist truck picked up these bundles on the bolsters and delivered them to their final destination on the job or to the bending tables.

**Direction**—For the Department of Sanitation of the City of New York, Richard H. Gould was engineer and A. R. Glock resident engineer at the Ward's Island plant. Fuller & McClintock, New York City, were consulting engineers for the project, and Pearce, Greeley & Hansen, of Chicago, were associated with them in the design of the aeration tanks.

Operations of W. H. Gahagan, Inc., of Brooklyn, general contractor, were directed by William Oberly, general superintendent. R. C. Wilson, vice-president, supervised the work of the Turner Construction Co., with G. F. Floyd, general superintendent, and N. Nelsen, superintendent, in direct charge of field operations.





BOULDER DAM reaches half-way mark in height above lowest point of foundations in bed of Colorado River. On April 24 concrete had risen to Elev. 865, of 362 ft. above bottom of cut-off trench (Elev. 503). With crest at Elev. 1235, height of U. S. Bureau of Reclamation's completed structure will be 729 ft. Concrete is being placed in main body of dam by Six Companies Inc., using cableways and 8-yd. buckets, at rates exceeding 200,000 cu. yd. per month (224,000 cu. yd. during March.) In completed dam concrete volume will total 3,400,000 cu. yd. View is from Nevada rim of Black Canyon, showing downstream side of structure and method of columnar block construction.

U. S. Bureau of Reclamation Photo.

# VIADUCT PIERS

## *Built With Plywood Forms and Vibrated Concrete*

**A**N EFFICIENT SYSTEM of form clamps and ties which facilitated rapid stripping and re-use of plywood panels and a method of internal concrete vibration employing an air-driven vibrator enabled Geo. M. Brewster & Son, of Bogota, N. J., general contractor, to complete in less than

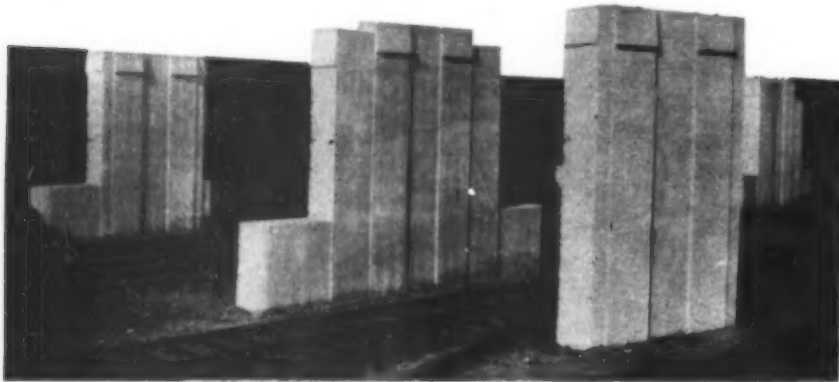
7 weeks 33 concrete piers for a 1,560-ft. viaduct section of Route 21, at Newark, N. J., being constructed under the direction of the State Highway Commission. Plywood panels, although high in first cost, provided seven re-uses and effected an eventual economy in form construction. Form clamps, of

an improved type which can be quickly and easily installed and removed, saved time, labor and materials. By the use of an internal vibrator, the contractor placed low-slump concrete with a minimum of labor and eliminated honey-comb, thus reducing the finishing cost.

*Viaduct Design—Viaduct Section 1*

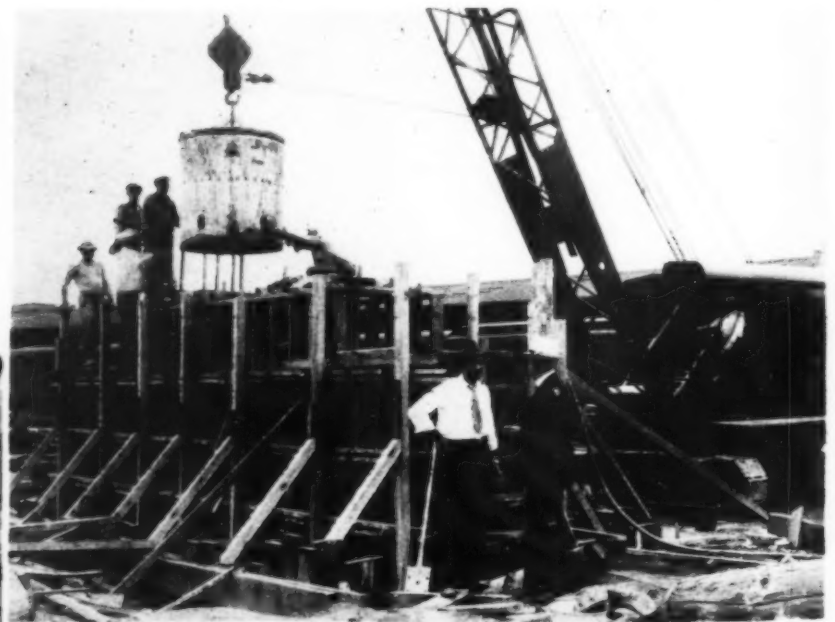


**AIR-DRIVEN VIBRATOR** with rigid shaft compacts stiff concrete in forms for viaduct piers. One man operates device.



**SMOOTH CONCRETE SURFACE** on faces of piers is obtained by use of plywood panels in construction of forms.

**BOTTOM-DUMP BUCKET** (below) on crawler crane delivers concrete in 1-yd. batches to pier forms.



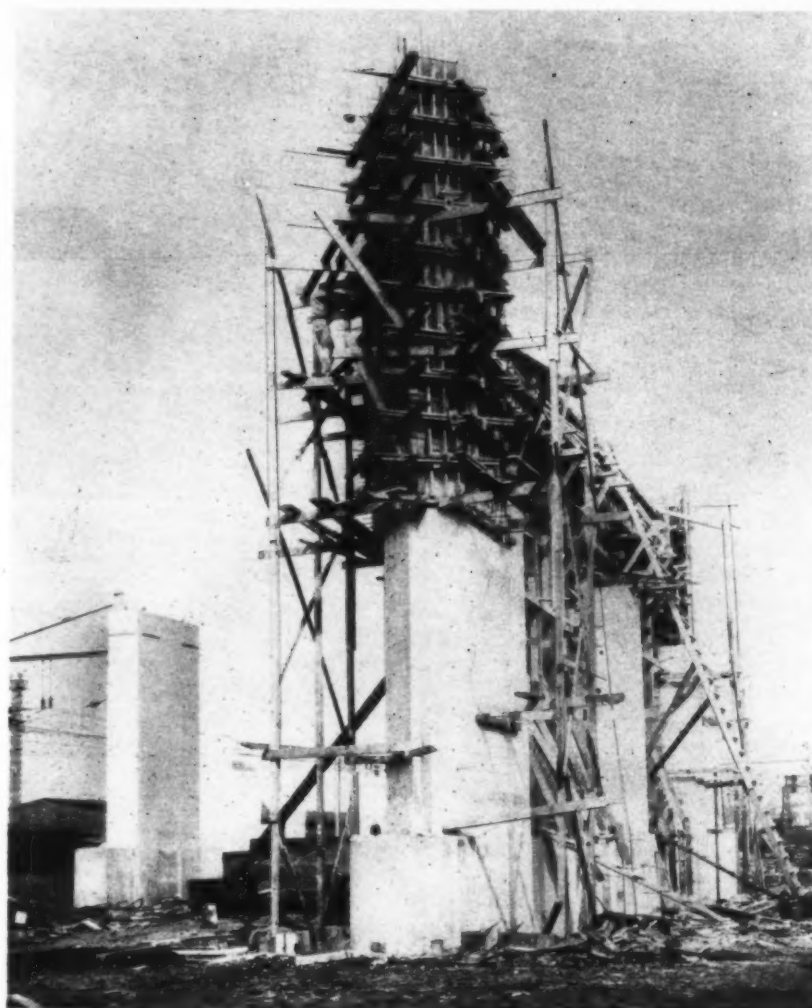
**VIADUCT** rises from south end of Broad St., Newark, and makes sharp turn across electrified main-line tracks of Pennsylvania Railroad.



of Route 21, being built under this contract, is a concrete and steel structure which rises from the south end of Broad St., Newark, and makes a sharp turn across the electrified main-line tracks of the Pennsylvania Railroad to connect with Section 2. The viaduct, which has a roadway width of 40 ft. and two sidewalks each 2 ft. 8 in. wide (with a maximum total width of 58 ft. at the curve) is carried by a series of 17 concrete bents made up of 33 concrete piers arranged to conform with the layout of yard tracks adjoining the main line, as indicated by the accompanying photograph. Each pier rests on a foundation of precast concrete piles.

**Construction Schedule**—Casting of piles for this section was started in the yard of the Massey Concrete Products Co. on June 13, 1933, and the first pile was driven at the site on Aug. 2. About 10 days later the contractor began construction of the pier footing on top of the first pile foundation.

It was customary to strip footing forms about 2 days after concrete had been placed and then to begin erection of the piers. Piers up to a height of about 20 ft. were constructed in one lift, and the higher piers, rising to a maximum of 45 ft. above the ground, were carried up in two lifts. In the case of those concrete bents which form structural units, with a single footing for the three columns of each bent, the design provides a collision strut between the columns extending about 5 ft. above the footing. The contractor poured these collision struts and adjoining columns monolithically with the footings.



TWO LIFTS OF CONCRETE were employed on higher piers, rising 45 ft. above ground level.

Construction began at the north end of the contract, adjacent to the south end of Broad St., with the piers of low elevation. Operations proceeded in logical sequence from this point to the

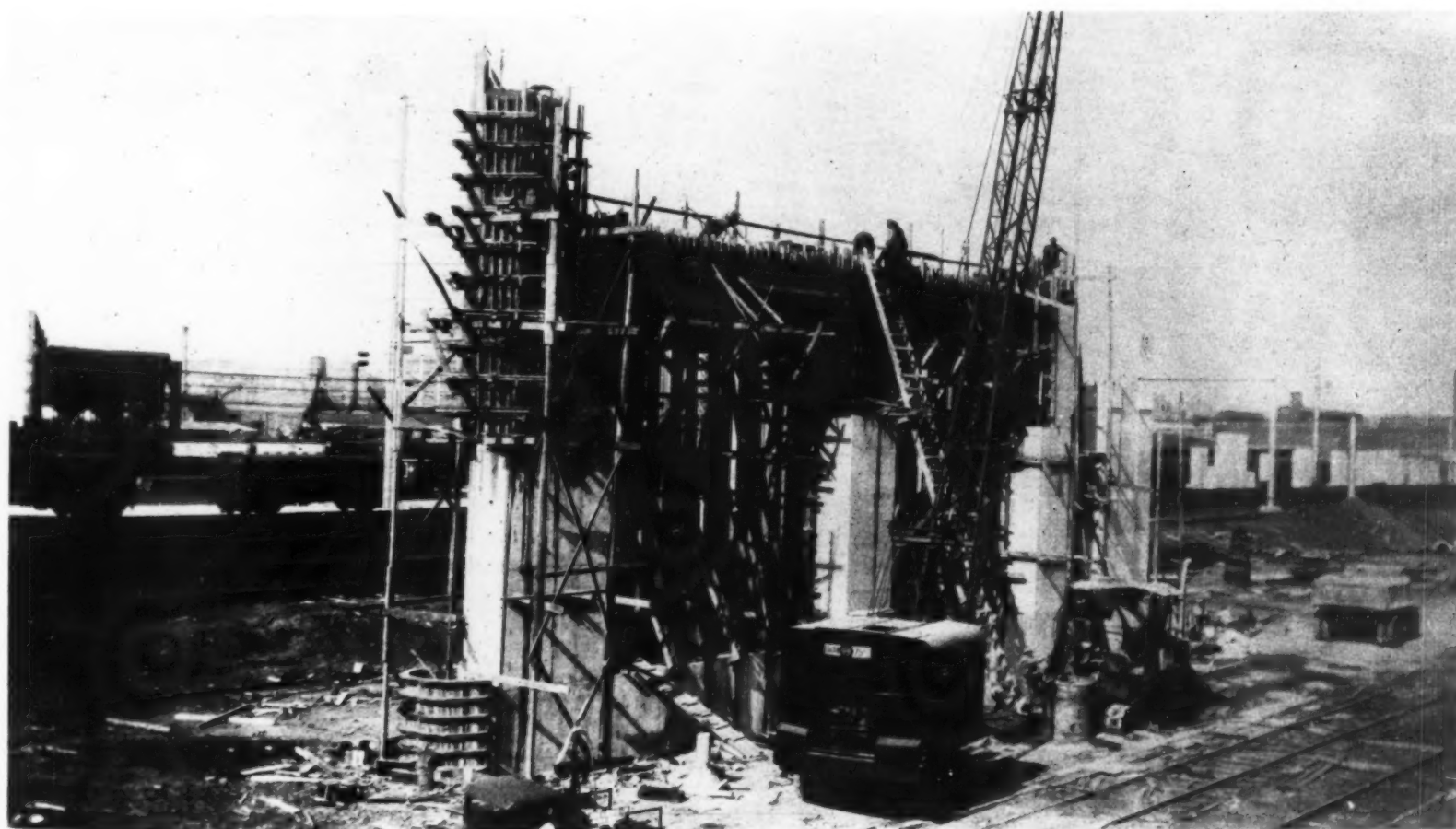
higher piers and to the three-column bents on the other side of the main-line tracks. As already noted, the first footing concrete was placed about Sept. 1. Between that date and Oct. 18, the con-

tractor completed the 33 piers, placing in all 5,400 cu.yd. of concrete.

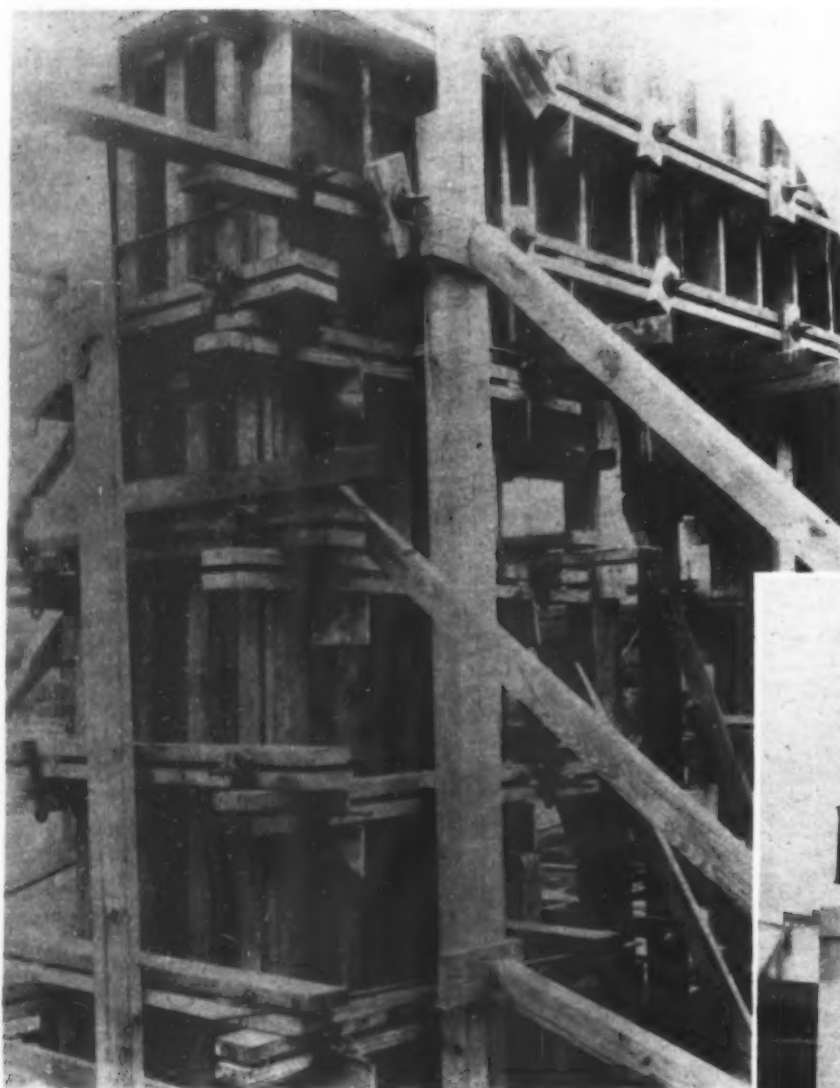
**Form Construction**—A total of 9,500 sq.ft. of  $\frac{3}{8}$ -in. plywood was purchased for the concrete forms, and this material was re-used an average of  $6\frac{2}{3}$  times. Most of the plywood was ordered in 4x8-ft. panels, which is a standard size for this material. To as great an extent as possible, the contractor attempted to preserve the form panels in large sizes, eliminating joints and reducing the labor and cost of finishing.

A form tie which could be easily and quickly installed and dismantled was an important factor in the economy and speed of the concreting operation. This form tie, as illustrated by the accompanying shop photograph, consists of a threaded rod and two cone couplers between the form walls and of two threaded rods between the double wales, one of them locked by a nut-and-washer combination and the other by a Colt form clamp. This clamp is fastened to the rod by a set screw and is tightened against the wale by an adjustable wedge which can be driven down as far as required. All parts of the Colt concrete form equipment—cones, washers and clamps—are cast malleable iron. On the Newark viaduct job, the contractor cut and threaded tierods at the site.

Several advantages were gained by the use of this type of form tie. The units could be assembled on the ground and could be inserted through the forms by a man on the outside, with the aid of a workman on the inside to guide the ties through the walls. Only the cheapest part of the unit, the threaded rod between the cone couplers,

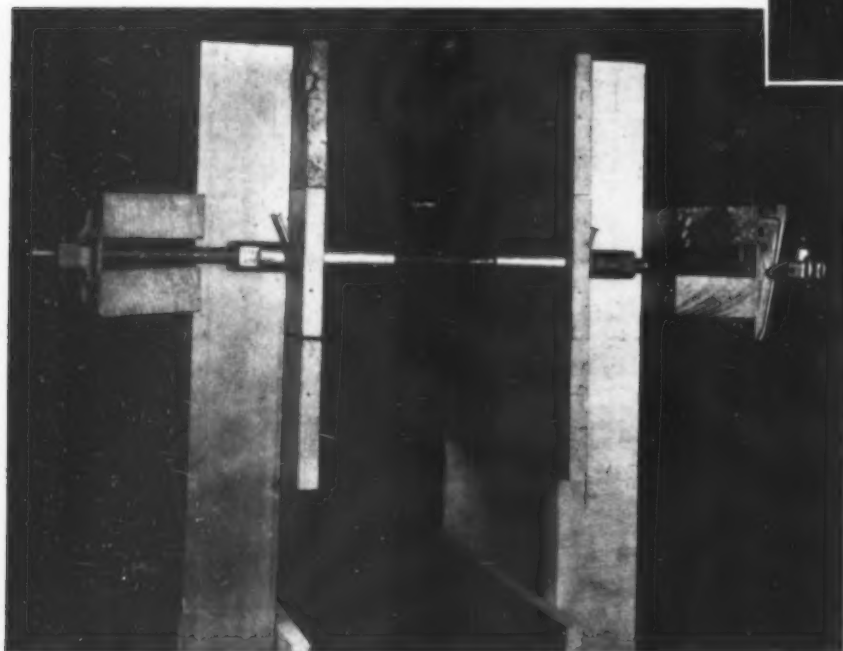


THREE-COLUMN BENTS are supported by single footing forming structural unit. Paving mixer, without boom, supplies concrete to crane bucket.



FORM TIES (above) are used to lock wales at corners of column forms outside struts.

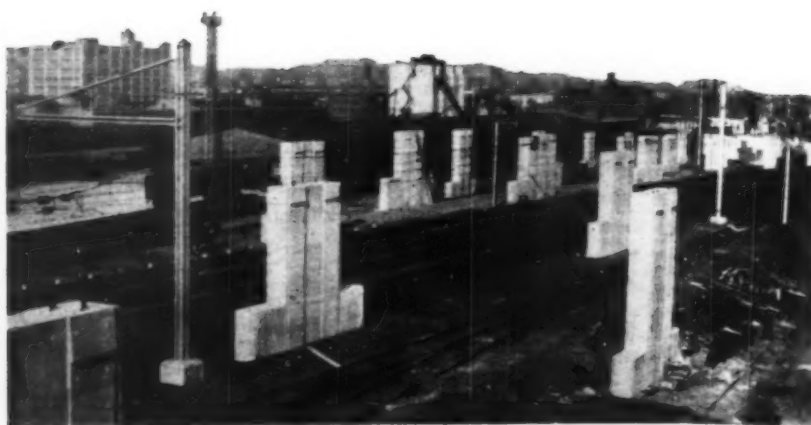
THREADED ROD (below) and removable cone couplers are inserted through forms.



was left in the concrete. The cone couplers could easily be screwed out of the concrete, at the end of any desired period, with the aid of a hand wrench. When so desired, the cones could be left in the concrete after the forms had been stripped. This feature was useful in carrying up successive form lifts on the taller piers. In concreting the columns of the bents, the ties were used

to lock the wales at the corners of the forms outside the struts, as illustrated by one of the photographs. Ties of this type prove useful in stripping deck forms, which must be left in place 21 days.

**Concreting Methods**—Dry batches of concrete ingredients were hauled 14½ mi. by truck from a quarry and plant of George M. Brewster & Son and were



PIERS along railroad tracks completed and ready to receive steel of viaduct superstructure.



LOCOMOTIVE CRANES seat steel viaduct girders on concrete piers.

delivered to the charging skip of a Koehring 1-yd. paving mixer. For the first 1,000 yd. of concrete, placed in the lower piers, this mixer was equipped with an Insley 50-ft. hoist tower which elevated the concrete and discharged it down chutes into the forms. The rest of the concrete was placed by a Koehring gasoline crane with a Wiley 1-yd. bottom-dump bucket. This crane was able to place about 2,400 yd. of concrete with a 50-ft. boom; as the height of the piers and bents increased, however, it was necessary to install a 70-ft. boom to place the last 2,000 yd. The average amount of concrete placed each day was 171 yd., and the maximum was 216 yd.

**Vibration**—Internal vibration of concrete with a rigid-shaft air-driven Viber compactor enabled the contractor to use concrete with a slump of ¾ in., containing about 3 gal. less of water per cubic yard than the ordinary mixture. The vibrator consolidated this stiff concrete and eliminated air voids and honeycomb. Essentially, the vibrator consisted of an air motor mounted at the upper end of a tube, 3½ in. in diameter and 3 ft. long, containing eccentric weights which were rotated at

high speed by the motor. Two handles were provided at the upper end of the unit, on the motor housing, by which a man could manipulate the device. The machine was so constructed that a point of minimum vibration existed at the upper end of the tube and a point of maximum vibration occurred at the lower end, which was submerged in the concrete.

One man was necessary to operate the vibrator and a second man was employed to take care of a long air hose which connected the machine with an air compressor. Because of the great length of hose used on this work, the contractor utilized a compressor with a capacity of 350 cu.ft. per minute to maintain a pressure of 85 to 95 lb. at the motor.

**Management**—For the New Jersey State Highway Commission, Morris Goodkind, bridge engineer, was in charge of the design and construction of the viaduct. M. Vail, resident bridge engineer, directed operations on the project. Peter F. Pasbjerg, superintendent, was in charge of the construction of the piers for George M. Brewster & Son.



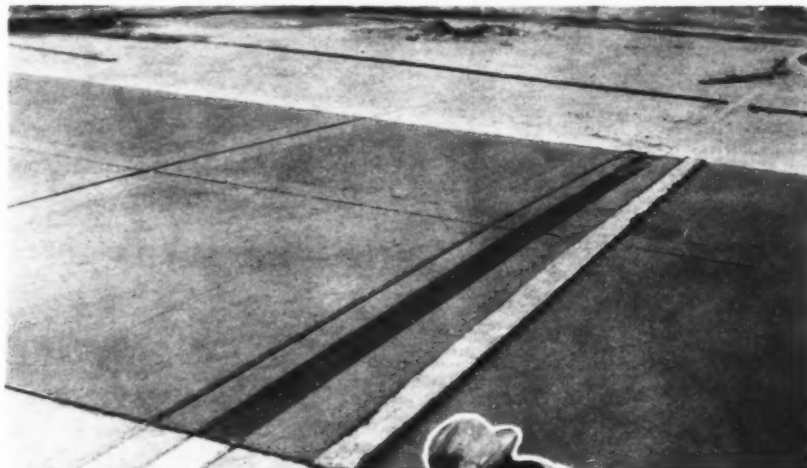
# Step-by-Step Field Methods

## Traffic Markers for Concrete Roads

**1** AFTER SURFACE IS STRUCK OFF, 1x6-in. board (*below*), planed four sides and with edges beveled to facilitate easy removal, is bedded in concrete flush with surface and weighted down, finishing operations proceeding on both sides of it. When concrete hardens sufficiently to prevent disruption of edges, board is removed.

**P**ERMANENT traffic markers of white cement were installed by the engineering department of the City of Seattle, Wash., at intersections in Pike St., one of the principal business thoroughfares, while resurfacing various worn asphalt, brick and granite sections with high-early-strength concrete.

Ready-mixed concrete was used for the street resurfacing. A minimum thickness of 5 in. was laid on the old concrete base, and the pavement was opened to traffic in four days. This speed was made possible by doing all



paving work at night under flood lights.

After the concrete surface had been struck off to grade, a 1x6-in. board was bedded in it and removed as soon as the concrete had set sufficiently to prevent disruption of the edges. The groove next was filled with mortar consisting of 1 part of white cement to 1½ parts of white sand, white marble chips, or both. The surface then was troweled, the edges marked with a ¼-in. radius edge and the surface was brushed to remove all extraneous color.

The accompanying photographs illustrate the sequence of operations.

**2** GROOVE (*right*) then is filled with mortar consisting of 1 part of white cement to 1½ parts of white sand, white marble chips, or both. Mortar is mixed to thick paste consistency and thoroughly troweled into the depression to obtain perfect bond.



**4** ALL EXTRANEEOUS COLOR IS REMOVED (*below*) by brushing surface of white strip and adjacent edges.



**3** CLEAR, WELL-DEFINED LINE is obtained by careful troweling of surface and marking of edges with ¼-in. radius edger.



**5** PERMANENT TRAFFIC LINES (*left*) at intersection of Fourth and Pike Sts., as seen from upper story of tall building. Note natural parking line formed in concrete resurfacing by dummy joint 7 ft. from each curb.

# ROOF TRUSSES

## *of Heavy Timber*

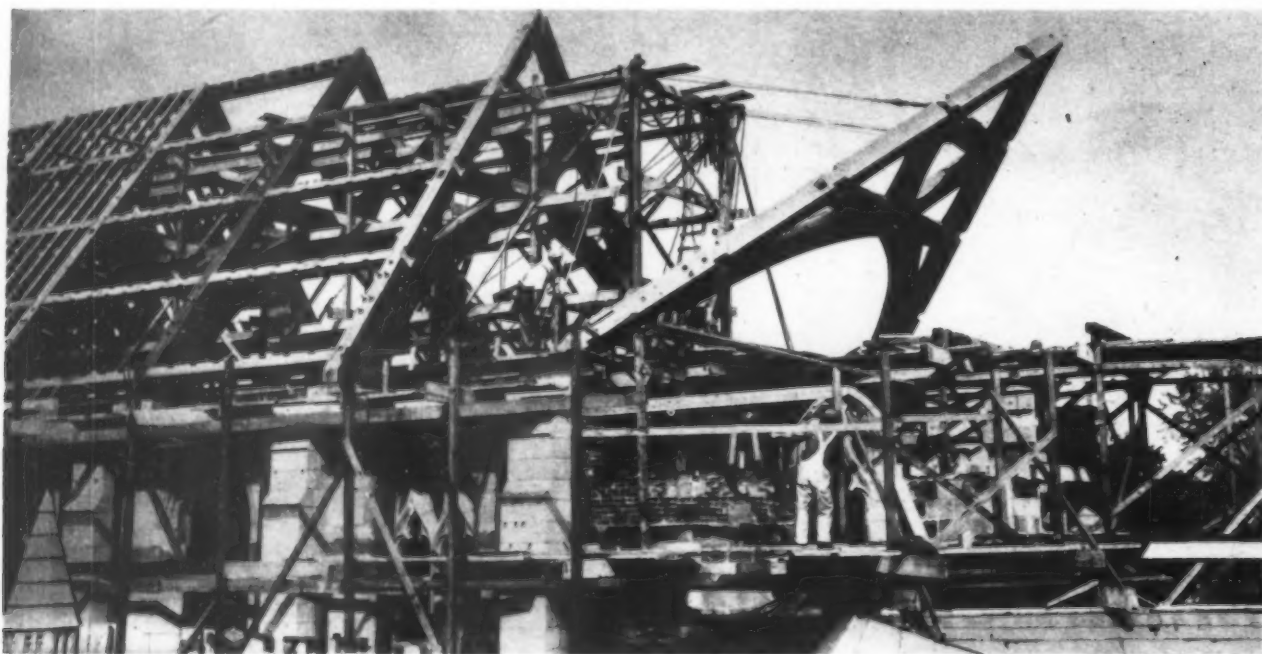
### *Erected on High Scaffold*

A WOOD SCAFFOLD 40 ft. high completely filling the interior of the Crescent Ave. Presbyterian church, which was rebuilt in Plainfield, N. J., after a fire, served to support during assembly and erection by Walter Kidde Constructors, Inc., of New York City, general contractor, nine timber roof trusses of 36-ft. span, weighing  $4\frac{1}{4}$  tons each. Timbers for the trusses and intermediate roof framing were hoisted inside the church and were assembled on a platform on top of the scaffold. The trusses were raised to vertical position by two hand winches operating three-part steel hoisting falls attached to a hoisting

original sandstone facing. The principal plan dimensions of the church are about 160x65 ft., and the clear distance between the clerestory walls, which are carried by two rows of concrete columns faced with stone inside the church, is 34 ft. The roof above the clerestory is supported by nine timber trusses of 36-ft. span, c. to c. of bearings, and the roof over the apse by four radial half-trusses framing into the adjacent full truss. About 50,000 ft. b. m., of Douglas fir timber was required for the trusses. On the trusses was laid about 25,000 b.-ft. of 2x6-in. tongue-and-groove Douglas fir sheathing, which was covered with three layers of felt



TIMBER ROOF TRUSS weighing  $4\frac{1}{4}$  tons is assembled on tall wood scaffold and raised to position by two hand winches operating hoisting falls attached to special frame resting on scaffold.



THREE-PART HOISTING FALLS attached to posts of special frame raise timber truss from flat to vertical position. Frame is guyed against overturning by steel cables running over roof to deadmen buried in front of church.

frame which was guyed against overturning by two cables carried over the top of the roof frame and anchored to deadmen buried in front of the church.

*Design of Rebuilt Church*—Original brick and stone walls left standing after the fire were incorporated in the remodeled structure, which is faced with a sand-cast artificial stone matching faithfully the surface texture of the

and a top protection of Vermont slate.

*Roof Framing*—Each of the roof trusses weighed about  $4\frac{1}{4}$  tons when raised. This weight later was increased to  $5\frac{1}{2}$  tons when knee braces were attached at both sides. The main rafters composing the top chords of the trusses were the heaviest pieces in the roof framing. Each main rafter, cut from a 14x40-in. stick, was a solid timber

14x18 in. by 35 ft. long, weighing  $1\frac{1}{4}$  tons. Purlins spanning between the trusses were 10x12-in. timbers, and the rafters mortised into the purlins were 5x6-in. pieces.

All connections of the roof frame are mortise-and-tenon, secured by wood dowels, except the horizontal cross struts of the trusses. These struts incase  $1\frac{1}{4}$ -in. tiebolts 18 ft. long, and the timber strut incasement was made

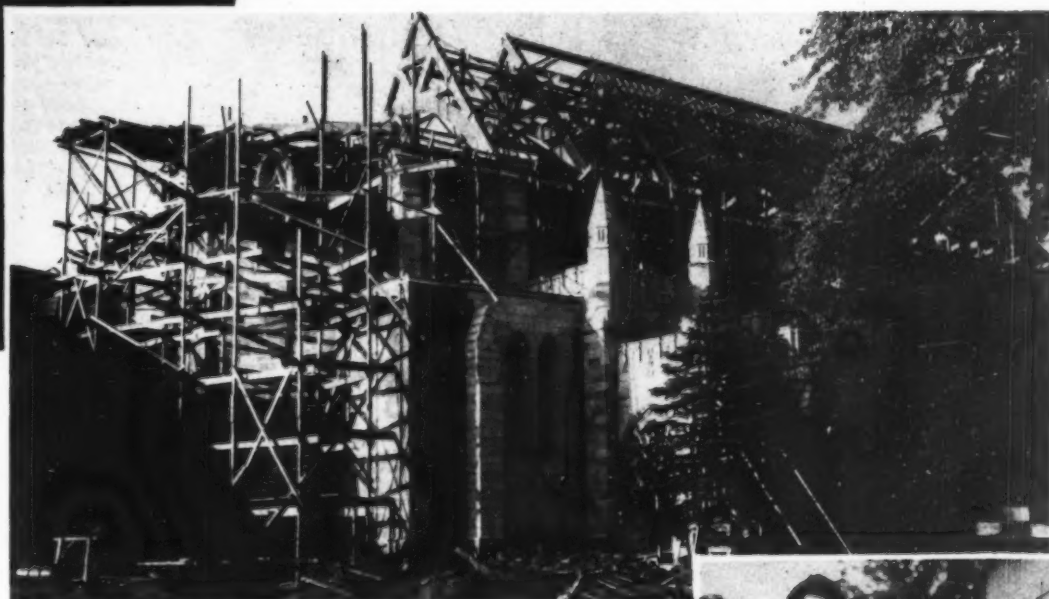
BUMPER BLOCK (below) built up against steel bearing plate guides heel of rafter to position on plate as truss is raised. Steel-cable loop around rafter is part of turnbuckle tie which prevents spreading of truss during erection.







**CAST STONE EXTERIOR FACING** (above) incorporated in walls left standing after fire and exposed timber roof framing are features of remodeled church. **NINE TIMBER TRUSSES** (right) support roof above clerestory. Last of nine trusses and four radial half-trusses over apse remain to be erected. Area covered by timber framing is about 160 x 36 ft.



in two pieces, with recesses for the bolt in two halves, to facilitate field fabrication of the unit. It would have been almost impossible to drill straight holes for the bolts in solid timber struts.

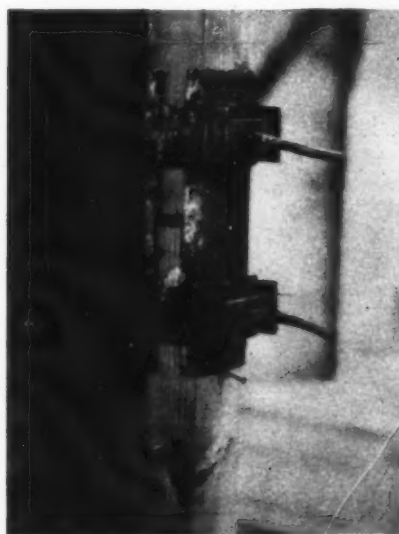
Cutting, shaping and framing of the timber were performed by the Northeastern Lumber Co. at its mill in Reading, Pa. The millwork included the cutting of all tenons and mortises for the connections except the cutting of

notches in the 10x12-in. purlins for the 5x6-in. rafters. This notching was performed at less expense on the job with an electric lock-mortising machine and an electric router. Exposed surfaces of the timber were given an application of oil filler at the mill and were covered with a coat of flat varnish after the roof had been completed.

the two posts of the hoisting frame, which served as a pair of gin-poles in raising an assembled truss. Two single-sheave blocks at the tops of these posts and one single-sheave block lashed to the timber truss provided a three-part hoisting line for raising the truss. Each line was reeved from the top of the post through a single-sheave block at



**MORTISE-AND-TENON CONNECTIONS** and wood dowel pins are used throughout roof frame. All framing except notching of purlins is performed at mill. Layer of 2-in. t.&g. sheathing goes on frame.



**EXPANSION SCAFFOLD CLAMP** provides rigid, easily adjusted splice in scaffold post.

the base and thence to a hand winch installed on the scaffolding a short distance from the hoisting frame.

**Erection Procedure** — Against the steel bearing plates upon which the truss was to rest, the erectors placed strongly braced bumper posts to guide the base of the truss on to the bearing plate as the truss was raised. In addition, rope tackle was installed to assist in holding the truss in position during the raising operation, and the two main rafters of the truss were tied together near the base with a cable and turnbuckle tie to prevent spreading of the truss during erection. With these preparations made, two men on the winches operating the hoist falls raised the truss to vertical position in a few minutes.

**Supervision** — For Walter Kidde Constructors, Inc., C. W. Knowles acted



**A. W. SOINE** (left), superintendent, and **TOM THOMPSON**, rigger foreman, for Walter Kidde Constructors, Inc.

ed as general manager of construction. A. W. Soine, superintendent, was in charge of rebuilding the church. The method of erecting the roof trusses was devised and executed by Tom Thompson, rigger foreman. Zantzinger, Borie & Medary, of Philadelphia, were the architects.

# Getting Down to DETAILS

Close-up Shots of  
Job Methods and Equipment



**GRADE MARKERS**, devised by Superintendent M. Hjalmarson, of Metropolitan Water District of Southern California, aid concreting of invert for Fan Hill Siphon, part of Colorado River aqueduct. In low concrete piers, cast at 5-ft. intervals along both sides of invert center line to support reinforcement,  $\frac{3}{4}$ -in. steel bolts, projecting 6 in. and threaded for 2 to 3 in. at top, are set normal to invert surface. Square nut and truncated metal cone hub are screwed on to steel bolt, adjusted accurately to grade and tightened up with wrench. When invert concrete has set, metal cone is removed by unscrewing with large screwdriver inserted in slot in top of cone, which is 3 in. long and  $2\frac{1}{2}$  in. in diameter at base.



**TRAILER ROLLER** used by Minnesota State Highway Department for compacting newly constructed bituminous surface and bituminous shoulders where traffic is not heavy enough to stabilize road. Unit hauled by motor truck has eight pneumatic tires; its weight is 2 tons and ballast weighs from 3 tons upward, depending on nature of job.



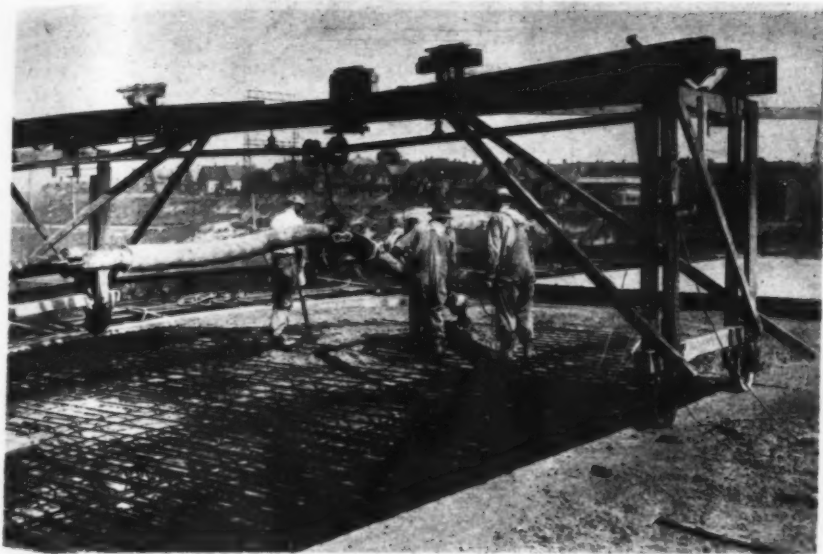
**DIVER'S STEEL FRAME**, hung from derrick boom, aids inspection of south pier foundations built by Pacific Bridge Co., for San Francisco's Golden Gate Bridge, which will have world's longest suspension span of 4,200 ft. Swift tidal currents at pier site add to difficulties of submarine work.



**SPRINKLING KINK** is devised by John Mackler Co., contractor, on Illinois concrete paving, to simplify curing of slabs with wet burlap. Hose, equipped with spray nozzles supported by rollers, may easily be moved about on job.—Photos from ERNST LIEBERMAN, chief highway engineer of Illinois.







**DISTRIBUTING PUMPED CONCRETE.** Improvised gantry crane and trolley (at left) support large rubber hose discharge line connecting with Rex "Pumpcrete" outfit supplying concrete to forms for floor of 35th St. viaduct in Milwaukee. **ROLLER SPOUT** (at right), in use during construction of Milwaukee sewage treatment plant, allows continuous pumping of concrete when removing 10-ft. sections of pipe.—Photos from CHAIN BELT CO., Milwaukee.



**SPECIAL GROOVED WHEEL** places load of finishing machine for concrete pavement sufficient distance from edge of slab to prevent spalling.—Photo from H. A. SPARKS, assistant construction engineer, Ohio State Highway Dept.

**DUAL MARKING MACHINE** (below) halves time of painting 6-in. wide traffic lines on three-lane highways in New Hampshire. Machine, operated by three-man crew, carries air compressor and paint tank supplying two spray nozzles on outboard assemblies at both sides of 1½-ton truck.—Photo from F. A. GARDNER, assistant engineer, New Hampshire Highway Department.

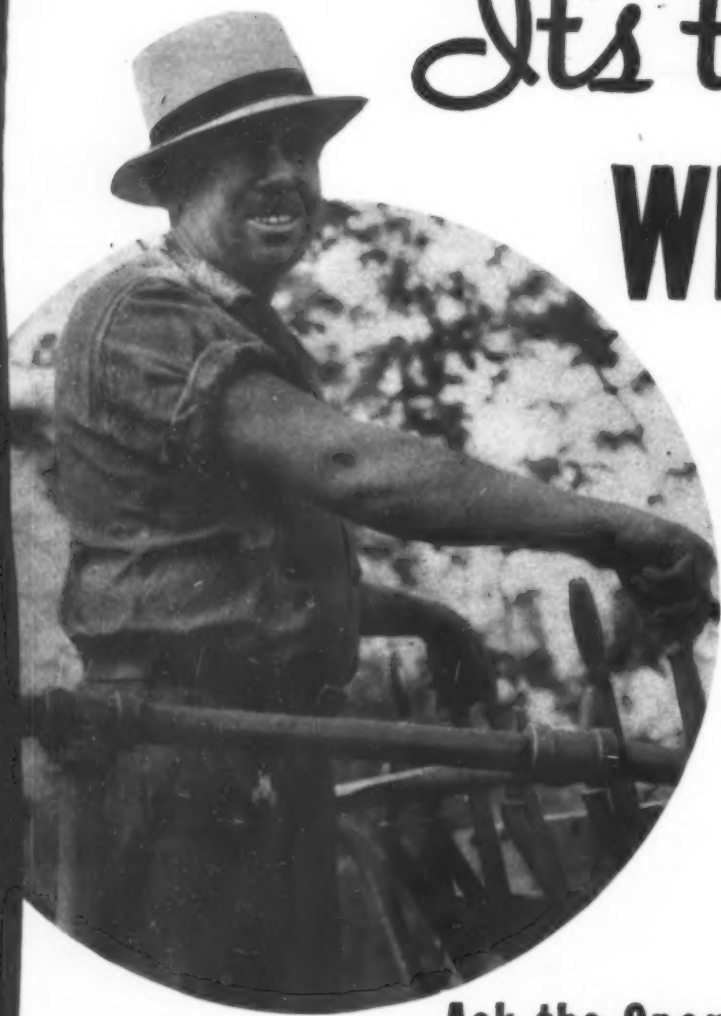


**MECHANICAL MUCKING EQUIPMENT** on tunnels of Colorado River aqueduct, being built by Metropolitan Water District of Southern California, is operated electrically. At heading, dipper of Bucyrus-Erie loader is used to kick loaded car down track. Then jib derrick picks up empty from track behind and swings it over to main track for loading. Transfer is completed in less than minute.



**DITCH CLEANING** on Huntington Division of Chesapeake & Ohio Railroad near St. Albans, W. Va., is done by front-end loader mounted on Cletrac tractor. Bucket has capacity of 20 cu. ft. Speed of loaded machine is 250 ft. and, empty, 350 ft. per minute.

# "It's the **LEANING FRAME** **WITH POWER CONTROL** that makes the Difference



## Ask the Operator

No wonder he smiles—operating a No. 14 Leaning Frame Power Controlled Grader. He can put the blade anywhere he wants it, work in more difficult places, do a better job . . . and no more back-breaking hand operation.



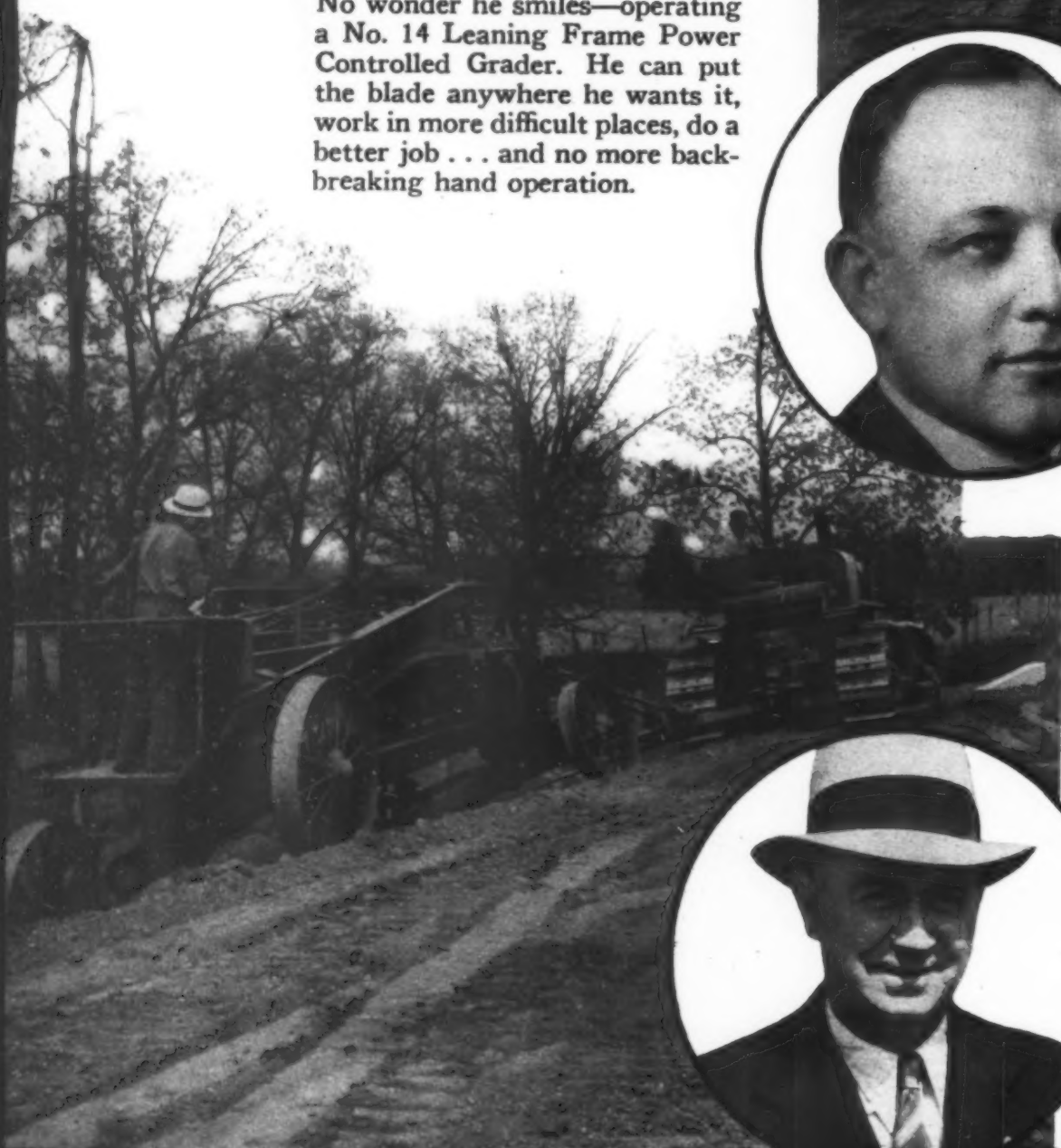
## Saved \$75 a day

"We moved a 3-inch layer of old material from the wide shoulder next to a stretch of one-strip pavement", said Jack Hartmann of Hartmann-Clark Bros. Co. "Because of the leaning frame and long blade reach of the No. 14, we were able to run both left wheels on the pavement, and still cut the entire 8-foot strip to be removed, wasting the dirt into the ditch. With an ordinary grader, it would have been necessary to use another tractor, an elevating grader and several trucks—at considerably more expense."

• • •

## Really Moves Dirt

"The leaning frame is the best principle I have ever seen on a grader", said C. E. Nelson of the Nelson Construction Company. "We have used other makes in the past, but you couldn't give them to us now."





M  
RO  
ence



## Does Tricks

"Watch the operator slope around that telephone pole," said Contractor Huseh of Adolphson & Huseh. "No need to change the blade position or back up. He just moves the frame over."



## After Two Years

"When we can't do it with other equipment we send for a Model 'L' and No. 14", says Joe Kesi, Jr., of Joseph Kesi & Sons. "Only a Leaning Frame grader for us."

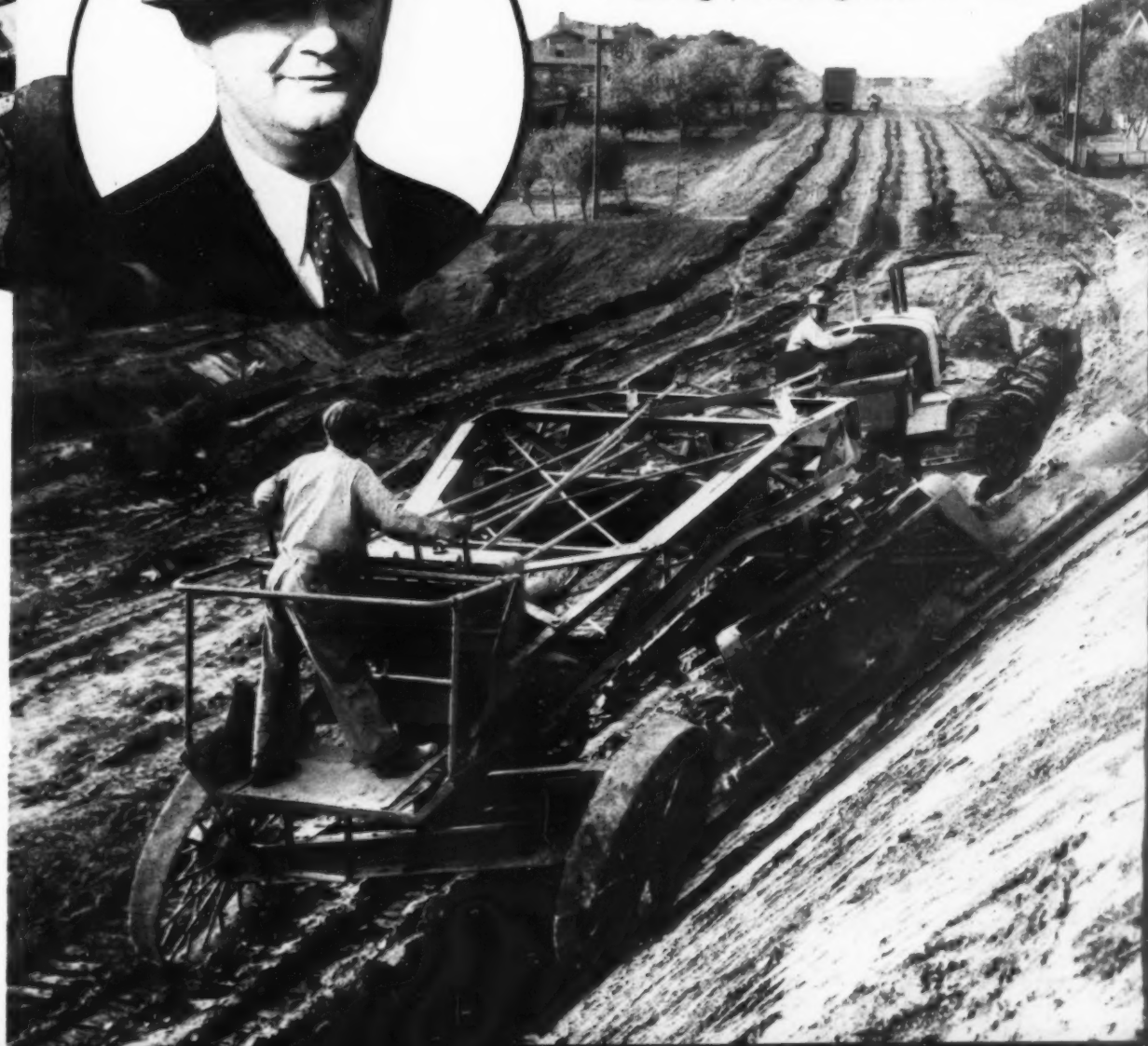


## FASTER OPERATION

The exclusive Leaning Frame feature of the No. 14 Grader makes the difference between just a grader and a grading machine. Power control means instant action. The Leaning Frame enables the No. 14 to work at difficult angles where ordinary blade graders cannot operate. The operator leans the frame into or away from his work — always doing an exact grading job.

Watch a No. 14 work and you won't be satisfied with old style equipment. The Leaning Frame is an exclusive A-C grader feature — and the "14" was the first grader to be Power Controlled.

**ALLIS-CHALMERS**  
TRACTOR DIVISION - MILWAUKEE, U. S. A.



## Third of a Series of Four Articles:

# PUTTING SYSTEM TO WORK IN FIELD AND OFFICE

3...

Daily and Weekly  
Unit Cost Reports

By GEORGE E. DEATHERAGE

Superintendent of Construction, South Charleston, W. Va.

**I**T CANNOT BE repeated too many times that, *Accounting records are valuable only when they are used as a basis for action.*

● Daily and weekly unit cost reports are a vital necessity as a basis for controlling construction work. Only by placing such information promptly and clearly in the hands of the executive in charge can he be expected to make proper decisions regulating the personnel and methods used on the job.

● Requirements of different contracting concerns with such a system in vogue, vary to some extent. A great many require a daily unit cost report in the hands of the superintendent early the next morning, while others are satisfied with such reports but once a week. In the writer's opinion the daily report is preferable and necessary. On jobs where the weekly payroll amounts to a large sum, say \$10,000 to \$20,000, an increase in efficiency of 5 per cent, due to a change of method or personnel, would mean a payroll reduction of from \$500 to \$1,000—a saving which is a large return on the expense of any additional clerical help.

● Daily and weekly unit cost reports have numerous uses in a contracting organization, as follows:

- (1) To supply the job superintendent with unit labor costs for job control.
- (2) To supply the central office with

a check on the job superintendent.

(3) To record properly, all labor charges for accounting purposes.

(4) To segregate costs and quantities for taxation purposes.

(5) To provide the basis and guide for future estimating.

● To prepare such a report, an example of which is shown herewith, it is necessary to have an accurate distribution of the following items:

(1) All labor expended, distributed according to a standard cost code.

(2) Accurate measurement of all work done during the shift.

● After this information has been properly collected and tabulated it is posted on the unit cost report forms, all of which are substantially as illustrated herewith. Numerous methods are in use for the collection and tabulation of such information. Some of them are extremely simple and inexpensive while others are so complex that they can only be described as "red tape".

● To obtain the proper distribution of all labor expended on the job a good many successful concerns depend on the foreman to distribute the time of all men under his direction on what is known as a "Foreman's report", an example of which is shown. These reports collected at the end of the shift, are "coded" by the time office, and charges summarized on a labor distribution sheet as shown. Other organi-

zations obtain distribution by means of "checkers" working under the direction of the time office, checking all men in the field about four times a day. The data collected by them is later summarized on a distribution sheet from which postings are made to the payroll and cost reports.

● A more simple and inexpensive system is what is known as the McCaskey system, in which each foreman is provided with a pocketbook of McCaskey tickets, in triplicate sets with carbon paper backing, used to record the time and distribution of each man on the job. (See illustration.)

● In this case each job performed is charged with the time of the man or men working, and sent to the time office at the end of the shift. Timekeepers fill in the rate for each man, extend and add the total for that day to the amount "brought forward", which is obtained from the last ticket turned in on the previous shift. This is all brought down to a grand total at the bottom of the sheet, giving a running total for all money spent to date on that specific piece of work. These summarized and daily totals are posted directly to the daily cost report eliminating the necessity for a distribution sheet.

● As the tickets are extended and summarized they are reconciled with time clock records, and the hours post-

ed directly to the payroll. This system divides itself therefore into only three major phases:

(1) Preparation of the McCaskey tickets by the foreman and timekeeper.

(2) Posting hours to the payroll.

(3) Posting expense summarized to the daily unit cost report.

● Another practical system for achieving the same result is through the system put out by the Frank R. Walker Co., of Chicago, and fully described in their literature. It also has the virtue of being simple as well as being applicable to both large and small work.

● The reporting of the quantity of work performed during the shift is handled in several ways, some of which are as follows:

(1) Reporting of work performed by foreman in charge of each division daily.

(2) By field engineers actually measuring the work and reporting same on printed forms for that purpose daily.

(3) By foreman's reports daily and checked by field engineers weekly to reconcile any error.

● All of these methods have their advantages and disadvantages. On small work the foreman's report is sufficient, while on work of large volume it is preferable to organize among the field engineering crew to turn in this data.



TIME SLIP is filled out by foreman.



FIELD OFFICE CLERK distributes labor costs.









# JOB ODDITIES

*A Monthly Page of  
Unusual Features of Construction*



**WHEEL FOR SOFT GROUND.** Demonstration at Paris, France, illustrates how increased bearing area in sandy material is provided for wheelbarrow, at left, equipped with special broad-tired disk, with raised rim for traveling on hard ground.



**SAFETY LAST!** On daily inspection of O'Shaughnessy dam, main feature of San Francisco's Hetch Hetchy water and power project, E. J. Palmer pauses in climb up ladder to admire scenery of valley 200 ft. below.



**MONKEY SLIDE** is name given by workers on Boulder dam to inclined rail skip which transports them from Nevada rim of Black Canyon to top of dam.



**A CLOSE SHAVE.** To allow for widening Wilshire Boulevard, Los Angeles, it was necessary to slice off twelve apartments from face of Rex Arms.

# What the Codes Mean to the Construction Industry



By HARRY O. LOCHER

Assistant Deputy Administrator, Construction Division  
National Recovery Administration, Washington, D. C.

● To readers of CONSTRUCTION METHODS Mr. Locher needs no introduction. He is the author of the recently completed series of seventeen articles on "Helps to Successful Contracting."

—EDITOR

**T**HOUGHTFUL and far-seeing construction men, sincerely interested in their industry and deeply disturbed over the unstable conditions which prevail in it, have long lamented its lack of genuine organization and cooperation. Their earnest effort to bring about stability has been most disappointing and all but futile. Too many others chose to remain non-cooperators and to roam disruptingly through the industry, with no thought of being helpful to it. The non-cooperators have failed to realize that in strengthening their industry they would make their own business more stable and secure. That which they have lacked the vision to see or the will to do has come, through sheer and vital necessity, in the Construction Codes of Fair Competition.

These codes, prepared by able, earnest groups of men—to whom is due a lasting tribute—in code committees, after tireless effort and patience, should organize the construction industry and give to it a cohesiveness and a stability which it has never had—if the construction men of the nation will give them united and wholehearted support. *In no other way can the codes succeed.* Those who are not for them can be counted against them. Vast good is in the codes, but it will not come from them automatically. The benefits which have been written into them can be realized only by men *working together in wholehearted compliance.*

## TO STABILIZE CONSTRUCTION

Construction codes are now law. We have too often seen the disastrous results of ex-parte laws; they were not supported and thus they destroyed more than they built. The construction codes are no one-sided laws. They are laws for the uplift and stabilization of a great national industry. They will make participation in it eminently fair to all. They will benefit all who are served by the industry. They will give the industry the stability and the distinction which the second largest industry of the nation should rightfully have. What

## FOREWORD

"In the accompanying article Mr. Locher, himself an engineer and contractor of the highest business and professional ethics, holds up his personal standards to builders. He points out clearly that the Construction Codes aim at uniformly high standards of business practice. He emphasizes the fact that the hope held out by the codes for a new and better order of the construction business depends for realization upon 100 per cent honest trial of the Construction Code provisions by all members of the industry. He pleads for observance and support of the codes on the grounds of both patriotism and enlightened, farsighted self-interest. His article should not only be widely read but should be thoroughly reflected upon."

ROBERT N. CAMPBELL,

Deputy Administrator, Construction Division,  
National Recovery Administration

Washington, D. C.

valid reason can a constructor have for failing to give them his support? What an opportunity for constructors! Such an opportunity, lost, may not come again!

The codes should have a full and fair trial. With united support they will correct the abuses which weigh so heavily upon the industry. It is of no moment if, in early practice, the codes are found not to be perfect. No reasonable man expected this. The codes can be modified or amended as field practice proves it necessary. Wise men, with vision, will place themselves solidly behind the codes. Looking forward, they can see their industry in a new and better day.

When an industry is in such a state that long continuance in it is a hardship to those who would be the most credit to it, that industry is diseased. When survival means a continuous struggle against unwholesome conditions, the time has come to change the order of things. When clean-working operators are at the mercy of the chiselers, a purging and a cleansing is due. In no other way can the industry become a firm foundation stone of the nation's economic structure.

The question, "What will be the effect of the codes on the construction industry?" is being heard on every hand. There can be but one reply: "How will construction men live up to their codes, and how will they cooperate?" Sharp practice has been running amuck. Demoralization and alarming business mortality have been the result.

Who will be next? The time has come in the construction industry for the views of wise men to prevail. The observance of proper business ethics is wisdom. Crafty men have made the going hard in construction. There has been too much surreptitious maneuvering, too much horse-trading. Those who practice craftiness—skimping of work, disdain of cooperation, collusion, unfairness, exploitation, bid peddling, bid shopping—ultimately lose with such immutable regularity that it is nothing short of amazing that men will continue to practice it. Owners and the public, along with upright constructors and their workers, always suffer when the slick fellows fall. Banks, surety companies and material suppliers are often caught in the crash.

## ESSENCE OF CODES

The essence of the codes consists of a few basic principles, business principles of fair competition long and only too well known. Constructors must realize, if their industry is to survive almost unbearable conditions, that business health lies in fair practice and unity. The unscrupulous disrupters—the mavericks in the herd—must not be allowed to survive.

In regulating maximum hours of work and minimum rates of pay, in eliminating unfair competitive practices and in bringing about the opportunity for sorely needed cooperation, construction men can feel with assurance that the money, time and sacrifices which

they gave in the formulation of their codes will not have been given in vain. But, again, these codes will not be automatic in bringing about results. The good in them must be brought out through concerted and determined action. There must be no laggards, no slackers, no traitors. Order must come. Prejudices must be buried. The chiseler, the exploiter and the sharp-shooter must be made to suffer the penalties for code violation.

## EFFECTS OF CODES

What will the codes mean to the construction industry? They will place all members on a basic plane of fair competition. Success will depend more largely than ever before upon managerial ingenuity. The range will narrow between large losses and large gains. Fewer owners will pay more, or less, for their work than they should. Gains for constructors, over periods of time, will be more satisfactory. Wild discrepancies in bid prices will be narrowed, as the hazard in bidding is lessened to some extent.

Modern and up-to-the-minute equipment will have to be more widely used. Every possible means for reducing construction costs will be utilized. Management will search its brains for savings. To stimulate ideas for economy and expedition of work, bonus systems to employees will, in all likelihood, grow rapidly. Capable and interested employees will have a larger and more important place in the construction picture. Costs of construction will come down, as greater management ingenuity, last-word equipment and increased employee interest come into play. Both the industry and the public will benefit greatly.

Area wage agreements will lessen the evil and hardships in labor disputes and conflicts. Labor will benefit. The exploitation of men as one vicious method of unfair competition will be removed. Here is where constructive labor leaders have an opportunity for real and lofty service, making genuinely effective their part in the recovery program. Leadership of the highest order, and vision, will be necessary. Dogmatism must be relegated, along with all jockeying for impractical, unjust advantages.

An approach to normalcy in construction is, without doubt, the surest



basis for general recovery. As an incentive for the revival of construction—in the bringing into play of private capital—costs must be kept within reach of what the public can afford to pay. There is no other way healthfully and permanently to stimulate this vital industry. In negotiating area agreements the heads of labor organizations have an opportunity to render conspicuous service to the construction industry and to the nation. As to the workers during such times, a reasonable wage which comes into their hands is immeasurably better than a high rate which cannot be paid. The money is simply not available. Employers have an equal opportunity to render conspicuous service; in conducting their business, during the recovery period on a margin of gain no greater than to assure the safety of their business. This will aid greatly in stimulating construction. It will also help immeasurably towards continuity in construction, with consequent vast benefit to workers. The negotiating of area agreements is a grave problem; it is not too much to say that it is the keystone in the construction recovery arch. *Will it be handled with logic, vision, wisdom and dispatch?* There must be no delay.

#### ACTION NEEDED

We cannot interminably negotiate. We must go into action. Results come more quickly from action than from delay. Mistakes can be corrected. Neither hits nor misses can come from limitless debate. Unless there be nation-wide action in working out regional area agreements, the construction codes will be like great ocean liners all ready for the crossing—but with no fire in their boilers. And, if area agreements set wages beyond what is possible, the construction industry will be like a boiler throbbing with steam—but with no connecting machinery to convert it into productive use.

More justice and better understanding must prevail in employer-employee viewpoints. This will call for broadness and a more tolerant, sympathetic relationship from both sides. The costly and evil results of past obduracy stand so stark and unmistakable it is a wonder that men have not, long ago, stopped to consider the utter instability of the relationship which they were trusting to sustain them.

To some contractors, the codes will mean many readjustments. To others, they will mean little more than taking into account certain hours of work and rates of pay. Office work will not be greatly increased or complicated. Such reports and data as may be required by the Administration will prove a benefit to constructors, rather than a hardship. It is not the intention or the desire of the Administration to place any undue hardships upon the industry; the opposite is true. The Administration is vitally interested in aiding the industry to function fairly and equitably, with as little additional burden to itself

and with as little Administration help as possible.

The uniform cost-accounting systems, which the various Code Authorities will formulate for their industries, will be no unreasonable hardship. Rather, any additional operating cost which they may impose will, without doubt, repay the contractor many times over in giving him more intimate and dependable knowledge of what his actual costs are. Too many contractors have nothing to show for a lifetime of effort but an accumulation of obsolete equipment, which represents little more than its weight multiplied by the current value of scrap. Such accumulations, and failure after failure, are grim reminders of the lack of a real cost-accounting system. *Can any wise contractor object to such a system?*

Constructors should not lose their zest or faith if tangible results are not immediately evident. The industry has been sick a long time. It is too much to expect a complete cure overnight. Faith must be kept alive. The will to keep relentlessly on must not weaken if the codes are to become really effective and beneficial. Good seeds have been planted. Healthy growth will come from them if they are carefully nurtured. If faith is kept and support is given, the codes will soon grow into walls of strength, standing as barriers between what is right and what is wrong. The construction industry will then be transformed from a potential economic graveyard to a place of opportunity for those who worthily participate in it.

Earnest, capable and high-minded men have been chosen to administer the codes. Members of the industry can feel safe in rallying behind them. If construction men will look upon their codes as *pledges of fair practice* and live up to them, the battle will be over, the victory won.

#### REASONABLE COSTS

The codes must work no undue hardship on the public; it must be given dollar for dollar. Costs cannot be unreasonably increased unless, concurrently, the good state of the public is increased. The net gain must be shared with the people, who, after all, support the industry. The success of the codes depends largely upon how they affect the people. The more economical construction can be made, without jeopardizing reasonable living standards, the more will the volume of construction increase. This will inevitably mean an increase in, and continuity of, employment. Great and lasting benefits to workers would be bound to follow. Few dollars, if any, so pervade and stimulate all channels of trade as do construction dollars. They can almost be called the life blood of our economic well-being. But construction must not become too costly, or this life blood will cease to flow

freely, bringing about under-nourishment in our economic health. Recovery would be gravely retarded. Further and additional hardships and privations would come to vast numbers of people. Sensibly guard the cost of construction, for the good of constructors and their workers, for the good of the people and, for the good of the nation.

Some members of the industry have been guilty of a selfish, grasping attitude. They have claimed work to which they were not entitled. This, too, has been true of some unions. Such members of the industry and such unions should remember the dog who lost the substance in grasping at the shadow. To say that certain competitive customs have always prevailed means less than nothing. It is because certain customs have prevailed that disintegration and confusion are rife today.

In writing the codes, special effort has been made to avoid conflicts or overlapping in definitions or functions of work. It has not, however, been possible to accomplish this completely. Constructors and unions should consider, when tempted to go over the line, whether they might be treating fellow members of their industry or unions in a way which they would not consider fair practice were the situation reversed. The results of such practices always prove harmful to both industry and the unions. Construction men and unions should divest themselves of past prejudices and henceforth go forward together for the good of all.

Owing to grossly unfair competition and to the skimping that has followed in its wake, pride of workmanship in the construction industry has suffered alarmingly. "How well can we do the job" has disappeared from too many codes of ethics. With competition made rational, continuity of employment made more secure, and the welfare of its people looked upon as the soundest basis for the welfare of the industry, pride of workmanship will again honor the construction industry of America.

#### CODE AUTHORITY PROBLEMS

The actions and decisions of Construction Code Authorities should be such as to inspire the spirit of cooperation and to instill confidence in all members of the industry. The Code Authorities have a tremendous responsibility. The destiny of construction is largely in their hands. On how they handle their responsibility depends whether the codes will live and set the industry at last upon a firm foundation. *There is nothing more vital in the whole code set-up than this.*

Divisional or regional Code Authorities or Agencies should be organized and begin to function at the earliest possible moment. The construction industry is nationwide and the codes cannot be effectively administered from too far afield. This is equally true, too, of compliance; it cannot be

effectively watched from a distance or by a single centralized body. The Code Authorities will need funds with which to carry on their vital work. Every member of the industry should look upon it as a duty to contribute his just share, even if it may seem a present sacrifice. Ultimately—and soon—he will surely gain. It is an investment made in *his* industry. The return he may expect from it lies largely in his own hands. Is there not full justice and fairness in this?

It must not be forgotten that construction is, next to agriculture, the largest industry in the nation. How the construction codes are administered and lived up to will be critically watched by all other industries. As codified construction functions just so will all codified industry very likely function.

#### AN INTEGRATED INDUSTRY

Construction, under national unity and organization, will be recognized as never before. It will have far-reaching constructive authority and power. Operating as a great army, it can accomplish benefits for its members and for the public which a disintegrated industry could not even approach. What a far-reaching and promising opportunity is presented to the contractors of America! What a tremendous opportunity to be of service to the recovery program, the nation and themselves!

Non-compliance with the codes will drag down the innocent and the co-operators along with the guilty and the non-cooperators. This must not be permitted to occur. It is the duty of those with real interest in the recovery program to make every effort toward influencing and bringing about willing compliance.

The Administration recognizes that in the field is where the proving ground will be. It stands ready to co-operate with the Code Authorities in making such constructive changes in the codes as actual practice may prove necessary. Members of the industry can feel with confidence that any inequities or unfair and impractical exactions which may have gotten into the codes, or any omissions from them, will be promptly corrected by modification or amendment. They can feel, too, that violators who attempt to disrupt the codes will be made to pay the penalties provided.

A constantly increasing number of honorable constructors are awakening to the disastrous results of the evils in their industry. A new and determined unity is rapidly growing to co-operate in abolishing these evils. Tremendous new-born encouragement has come in the codes. With unwavering faith in these codes, and loyal support for them and for the splendid groups of men who will administer them, who can deny that construction is on the verge of a better day, and that this new day will be brighter than any known before?



FIRST PAVER of two units operating in series places bottom course of concrete exclusively. Second paver spreads top layer on steel mat reinforcement.

# Two Pavers in Sequence

## *Build Reinforced Concrete Slab*

**T**O EXPEDITE building of New York State reinforced-concrete pavement, which requires construction in single lanes and installation of prefabricated mats of steel reinforcement 2 in. below the surface, a number of contractors have experimented with the operation of two paving mixers in sequence, the first mixer placing the lower layer of concrete exclusively and the second paver spreading all of the top layer and a portion of the bottom layer. Two paving contractors, the Good Roads Engineering & Contracting Co., of Wantagh, Long Island, N. Y., and Schiavi & Fisher, of Buffalo, N. Y., used arrangements of this kind last fall in building parts 3 and 2, respectively, of the Sunrise Highway Extension, on Long Island, for the New York State Department of Public Works.

In a territory where an average of 30 batches per hour has been considered satisfactory for a single mixer, the dual set-up of the Good Roads Engineering & Contracting Co. averaged 54.5 batches per hour on construction of the main highway. The average established by Schiavi & Fisher was 50.2 batches per hour. On their best days, these contracting outfits produced averages of 65.3 and 62.2 batches per hour, respectively.

**General Conditions**—Preliminary grading of the relatively flat, sandy soil on the two contract sections already had been completed, and only the fine grading remained to be performed by the paving contractors. On open right-of-way the pavement consisted of four



OPERATING OUTSIDE OF FORMS, paving mixers leave subgrade clear for tractor-drawn strike-off.



DRAWN FORWARD BY TRACTOR, strike-off levels lower layer of concrete to receive steel mat reinforcement.

10-ft. lanes of uniform 9-in. thickness, separated into two double-track roadways by a 10-ft. grass strip down the center of the pavement. Where the roadway passed under bridges carrying intersecting routes the design eliminated the grass strip and increased the pavement width to 60 ft. between connections with approach roads. A white traffic line, made with white portland cement and cast in place, was installed to separate the two sides of the pavement under the bridges.

**Joint Support**—Reinforcing steel in prefabricated mats was incorporated in the slab 2 in. below the surface. To prevent slab settlement under traffic at transverse expansion joints the design provided an unusual form of joint support. These supports consisted of slabs 4 ft. wide and 6 in. deep cast in the subgrade in advance of pavement construction. The 4-ft. width of the slab joint support was divided 1½ ft. and 2½ ft. on the two sides of the expansion joint, the wider portion being allotted to the side which receives the impact from passing traffic. Welded wire mesh reinforcement was placed in the supporting slab 2 in. above the bottom.

**Part 3 of Extension**—Paving work on part 3 of the Sunrise Highway Extension by the Good Roads Engineering & Contracting Co. began on Sept. 11 and continued until Jan. 16, when the paving was completed. During the first two weeks paving work was confined to the approaches of bridges intersecting the Sunrise Highway. Actual mainline paving did not begin until





SLAB JOINT SUPPORTS are cast in advance with concrete delivered by truck mixer.



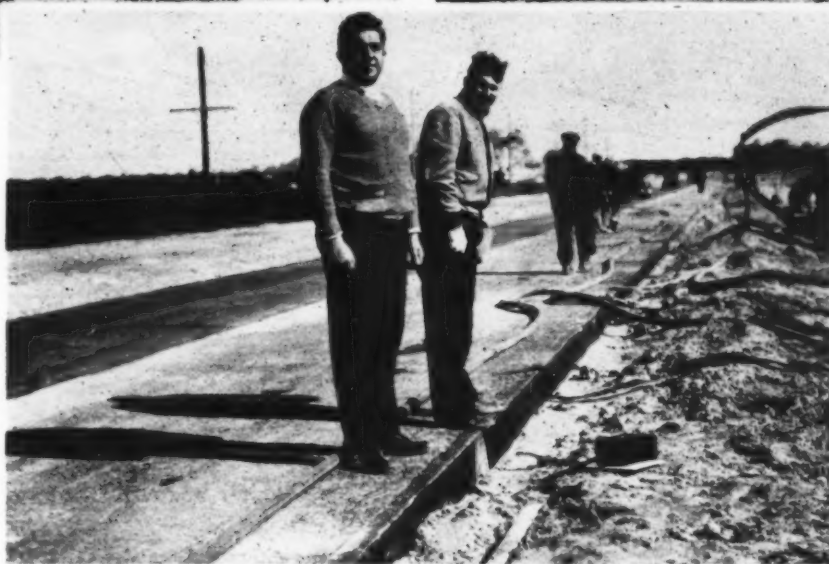
TO SUPPORT EXPANSION JOINT in pavement, design calls for reinforced-concrete slab footing 4 ft. wide and 6 in. deep cast in subgrade in advance of paving. Note wide-base forms in background used in soft earth.

Sept. 27. From this date until Nov. 11, when the main highway paving was completed and supplementary work was resumed, two mixers in sequence carried on construction of the main highway, one lane at a time.

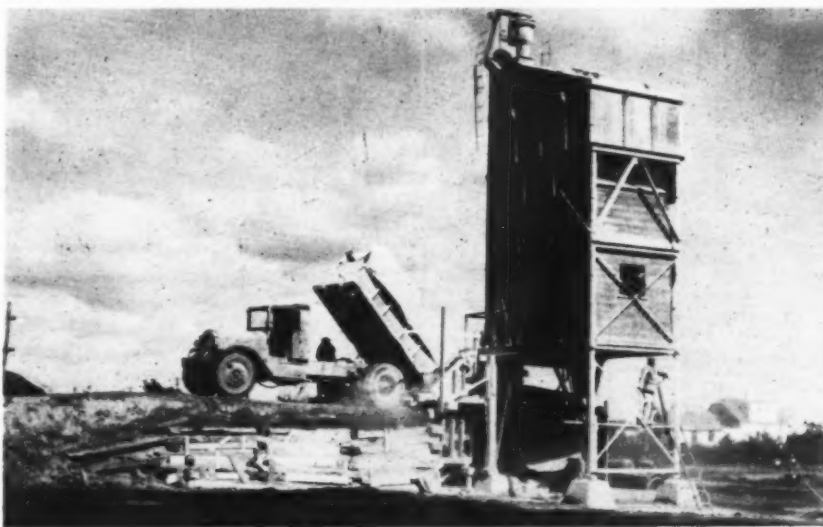
In a total working time of 311 hr., 14 min. (Sept. 27 to Nov. 10, inclusive), the two pavers in sequence produced 16,927 batches, an average of 54.5 batches an hour. On the best day, Oct. 27, when the two machines worked 9 hr., 55 min., they produced 647 batches, or 65.3 batches per hour. From Nov. 11 to Dec. 7, inclusive, the two mixers worked on widenings at the bridges and on intersections and approach roads. This work required frequent moves of the paving mixers, but the two units mixed and placed 4,177 batches in 85 hr., 21 min., an average of 49 batches per hour.

Final concrete paving operations on the supplementary features of the contract were performed by one mixer on the days when weather permitted from Dec. 7 until Jan. 16, when the work was completed. The single mixer produced 1,141 batches in 41 hr., 38 min., averaging 27.4 batches per hour.

*Job Layout*—Part 3 of the Sunrise Highway Extension is 3.19 mi. in



MICHAEL KOVAR (left), assistant civil engineer, State Department of Public Works, and K. A. MOYER, superintendent, Good Roads Engineering & Contracting Co.



length, and the contract called for 118,000 sq.yd. of pavement, including some 8-in. pavement on access roads. A batching plant, to which both aggregates and bulk cement were delivered by truck, was erected by the contractor near the center of the job. Four-batch trucks backed under an aggregate bin and drove through a cement bin in taking on dry batches at this yard. Each batch contained 658 lb. of cement, 1,616 lb. of sand and 2,234 lb. of crushed trap rock. These ingredients were mixed with 31 gal. of water to yield 1.11 cu.yd. of concrete per batch.

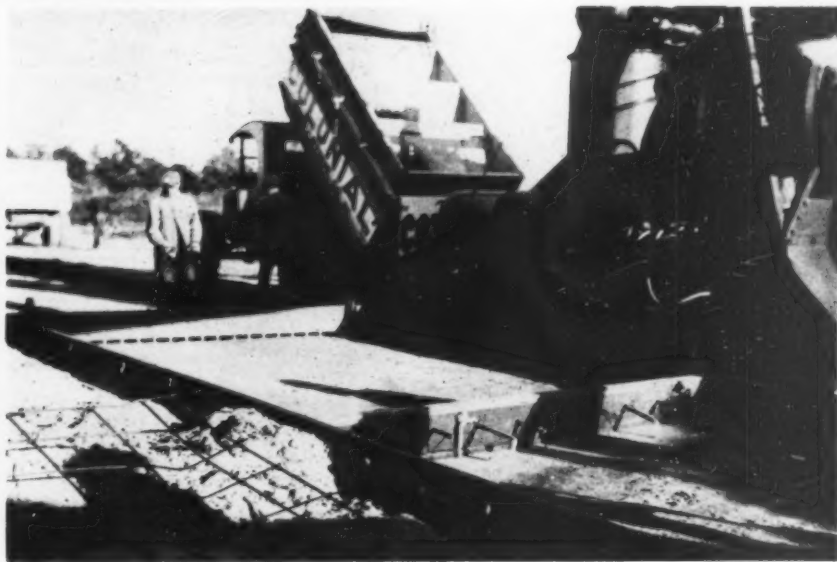
Bulk cement was delivered by rail to a siding in Babylon where the cars discharged the material into a track hopper. The cement was transferred to a 100-bbl. bin by the screw conveyors of a Blaw-Knox unloading plant. Cement was drawn off from the 100-bbl. bin to the trucks hauling to the batching plant.

At the batching plant, the trucks backed up an inclined ramp to dump their loads into a hopper from which

BULK CEMENT (left) is hauled by truck from railroad and is elevated to overhead bin under which batch trucks are loaded as they drive out of plant.



SUBGRADE PLANNER drawn by tractor shapes subgrade to correct profile for pavement construction.



EXPANSION JOINT of premolded asphalt, with dowel rods, is erected on concrete supporting slab. Scratch templet makes final check of subgrade.



ALFRED SCHIAVI (left), superintendent for Schiavi & Fisher, and I. FINKELSTEIN, assistant civil engineer, New York State Department of Public Works.



TWO PAVING MIXERS face each other as they build concrete pavement in two courses with steel mat reinforcement between layers.

an 8-in. horizontal screw conveyor and a bucket elevator transferred the cement to a 225-bbl. bin of a complete Blaw-Knox plant. Cement for each batch was weighed by a batcher with automatic electric discharge control.

Sand and stone were handled into a 60-yd. aggregate bin, equipped with batchers, by a Koehring crane operating a 1½-yd. Hayward clamshell bucket on a 50-ft. boom of 35-ton capacity. Six to eight Autocar four-batch trucks hauled from the plant to the mixers.

**Paving Set-Up**—Trucks and mixers operated outside the forms to prevent rutting of the sandy subgrade. No set schedule of deliveries, by which the trucks would follow a regular routine in hauling to the mixers, was feasible, because the mixers themselves adhered to no rigid procedure. The forward mixer, a Koehring 27-E paver, placed concrete for the bottom layer exclusively. When the second paver, a Foote 27-E machine, placing all of the 2-in. top layer, caught up with the more slowly moving advance unit, the forward mixer pulled ahead, leaving a gap of bare subgrade which the second paver had to cover with the bottom layer before it could resume placing the top layer. According to K. A. Moyer, superintendent for the Good Roads Engineering & Contracting Co., the first paver placed about 35 batches to each 25 mixed by the second unit.

A mixing period of 1¼ min. was required by the specifications, and the batchmeters on the mixers were set at 1 min., 20 sec. to allow for the additional time consumed by the materials in sliding into the drum. Even with this batchmeter setting, a single-drum mixer could produce about 40 batches an hour, if all conditions were favorable.

A special strike-off, devised by the contractor and pulled by a 15-hp. Cletrac tractor, leveled the concrete of the first layer for the installation of the reinforcing steel. The strike-off was equipped at both ends with wheels which rode on the steel forms or on the completed slab. The tractor traveled on



STRIKE-OFF on one of two contract sections is pulled forward by hand. Steel mesh reinforcement has been placed.



ROLLING BRIDGE of proper rectangular dimensions facilitates use of longitudinal float. Surface is given broomed finish before application of bituminous emulsion.

the subgrade and pulled the strike-off forward by a cable.

**Part 2 of Extension**—Construction of main-line pavement on part 2 of the Sunrise Highway Extension was begun by Vincent Schiavi and T. J. Fisher on Oct. 17. Operations continued until Nov. 23, when the paving work was shut down for the winter. Because of a requirement that local labor be employed for all except key positions in the organization, the contractor had some difficulty in developing 100 per cent efficiency in the working force. During the period of training the organization, progress of the work was

retarded by the inexperience of the crews. The contract, 3.17 mi. in length, called for 99,600 sq.yd. of concrete.

Between Oct. 17 and Nov. 23, inclusive, two mixers operating in sequence on this contract produced 6,309 batches in 125 hr., 46 min., an average of 50.2 batches an hour. On Nov. 1, their best day, the two pavers produced 431 batches in 6 hr., 57 min., an average of 62.2 batches an hour. Daily runs ranged from a maximum of 8 hr., 10 min., to a minimum of 1 hr.; the average was about 5 hr.

Concrete ingredients were loaded into four-batch trucks at a commercial

plant of the Colonial Sand & Stone Co., situated ¼ mi. west of the east end of the contract. That company supplied sand and crushed rock and erected a special bulk-cement plant to handle cement for the contractor. Each batch contained 658 lb. of cement, 1,347 lb. of sand and 2,293 lb. of stone.

Paving procedure on this contract was similar to that on the work already described, with a Rex 27-E paver ahead, laying base only, and a Smith 27-E mixer in the rear placing all the top and part of the base. At intersections, where high-early-strength cement was used to reduce traffic delays, all concrete was mixed and placed by one paver.

**Economy of Two Pavers in Sequence**—In common with other methods of high-production paving, the use of two mixers in sequence produces certain economies which must overbalance increased costs if the arrangement is to add to the paving profit. The superintendents on the two projects were of the opinion that two pavers in sequence could be operated to advantage only on wide and unobstructed projects where batch trucks could deliver to the mixers without difficulty. Fast production reduces the overhead charge and the equipment rental for certain items such as cranes, batchers, and finishing machines, which are essential to a low-production job but are capable of handling a high-production output without the addition of supplementary units.

**Supervision**—Design and construction of the Sunrise Highway Extension are under the general direction of J. J. Darcy, district engineer, New York State Department of Public Works, Babylon, Long Island, N. Y. On part 3 of the extension, Michael Kovar, assistant civil engineer, was in charge of construction for the state, and K. A. Moyer, superintendent, directed operations for the Good Roads Engineering & Contracting Co. The work on part 2 was supervised for the state by I. Finkelstein, assistant civil engineer, and for Schiavi & Fisher, the contractors, by Alfred Schiavi, superintendent.



# Present and Accounted For —

## A Page of Personalities



**DIVISIONAL CODE AUTHORITY MEMBER**—H. B. Zachry, president of H. B. Zachry Co., Inc., general contractor, of Laredo, Tex., and member of the Associated General Contractors of America is serving on the General Contractors' Divisional Code Authority, as announced in the April issue of *Construction Methods*.



**ASSISTANT CHIEF, T.V.A.**—Carl A. Bock, of the Morgan Engineering Co., Memphis, Tenn., specialist in water control engineering, has been appointed assistant chief engineer of the Tennessee Valley Authority, which is building the Norris and the General Joe Wheeler dams. Previously he had served on the Miami flood control project in Ohio.



**BOULDER DAM CONSTRUCTOR**—Harry W. Morrison, of Boise, Idaho, vice-president and general manager of Morrison-Knudsen Co., has been elected president of Six Companies Inc., contractor for Boulder Dam, to fill the vacancy created by the recent death of E. O. Wattis. Mr. Morrison has been identified for more than 30 years with many of the major construction projects of the West.

## Code Authority Members for Construction Machinery Distributors



**FRED MATTHEIS**, president, Hedge & Mattheis Co., Boston, Mass.



**H. E. STEWART**, president, Wylie-Stewart Machinery Co., Inc., Oklahoma City, Okla.



**E. K. HURST**, president, Western Materials Co., Sioux Falls, S. D.



**A. C. BLAISDELL**, president, Blaisdell-Folz Equipment Co., Cincinnati, Ohio.

# NEW EQUIPMENT ON THE JOB



**PIPE COUPLING** makes possible joining of straight plain end pipe without grooving, threading, beveling or upsetting of ends, no extra finishing operation being necessary. Provides strength in tension sufficient to meet all strains during assembly of pipe line or while line is under pressure. Consists of five parts: two steel, drop-forged half coupling sections, which contain gripping devices; one gasket with metal protected sections, and two bolts. Gasket designed to provide double seal equally effective against either pressure or vacuum. Couplings assembled on pipe have been tested up to 4,000 lb. per square inch, providing effective seal.—Champion Machine & Forging Co., 3695 E. 78th St., Cleveland, Ohio.



**WINDROW ELIMINATOR**, for attachment to any motor patrol grader, disposes of material piled in center of highway by grader blade and provides additional safety feature in road maintenance. Consists of a 12-ft. long, 14-in. high moldboard of Z-bar construction, to which is attached a reversible cutting edge of high carbon steel which spreads the surplus material smoothly across the bladed surface, depositing stones and clods at roadside. Blade is mounted on two heavy steel drawbars attached to hydraulically operated, cast-steel bracket, cushioned with heavy-duty recoil springs. Operated by two manually controlled hydraulic pumps within easy reach of operator. Blade has 10½-in. road clearance with quick drop and hydraulic downward pressure.—Hi-Way Service Corporation, 3841 W. Wisconsin Ave., Milwaukee, Wis.



**SMOOTHNESS OF PAVEMENT SURFACE** is assured by use of this three-wheeled roller (**ROLL-A-PLANE**) which reduces cost of surface finishing and subgrade preparation and imparts level smoothness. Particularly useful in bituminous paving, as center roll is capable of concentrating 85 per cent of total roller weight on high spots, creating maximum pressure of 20,375 lb. (with 10-ton roller) or a lineal inch compression of 450 lb., or more, depending upon amount of surface contacted. This center roller is hydraulically operated from dash and can be raised and lowered to any position to form perfect plane with other two rolls. Roll-A-Plane automatically indicates high or low areas, permitting immediate correction while asphalt is still hot and assuring a more intimate bond with uniform smoothness and color.—Austin-Western Road Machinery Co., 400 N. Michigan Blvd., Chicago, Ill.



**FUEL SAVINGS** as high as \$5.38 a day may be obtained by use of this diesel portable compressor. On basis of full load operation (100-lb. air pressure) at sea level when using diesel fuel at 6.2c per gallon, tests of 360-cu. ft. per min. compressors show that fuel cost for diesel portable is only 27.2c per hour, a saving of 67.3c per hour over gasoline models consuming fuel worth 15c a gallon, or a total saving of \$5.38 per 8-hr. day. Diesel portables equipped with Caterpillar diesel engines are available in various sizes.—Gardner-Denver Co., Quincy, Ill.

**AIR-OPERATED VIBRATOR** (right) for internal vibration of mass concrete is controlled by valve at operator's hand. Exhaust air is conducted from vibrator through a hose away from concrete. Vibrator shown is in use on bridge deck on New Jersey state highway, Route No. 6, Hasbrouck Heights, N. J., George F. Malley, contractor. It has 34-in. overall height for convenient handling in work of this sort, but can be made in any height up to 10 ft. for internal vibration of mass concrete in dams, lock walls or similar structures. On job illustrated, slump of concrete is about 2 in. Note flow under operator's foot.—Munsell Concrete Vibrators, Jersey City, N. J.







**BATCHER PLANTS**



**AUTOMATIC BATCHERS**



**TRUCK MIXERS**



**BULLDOZERS**



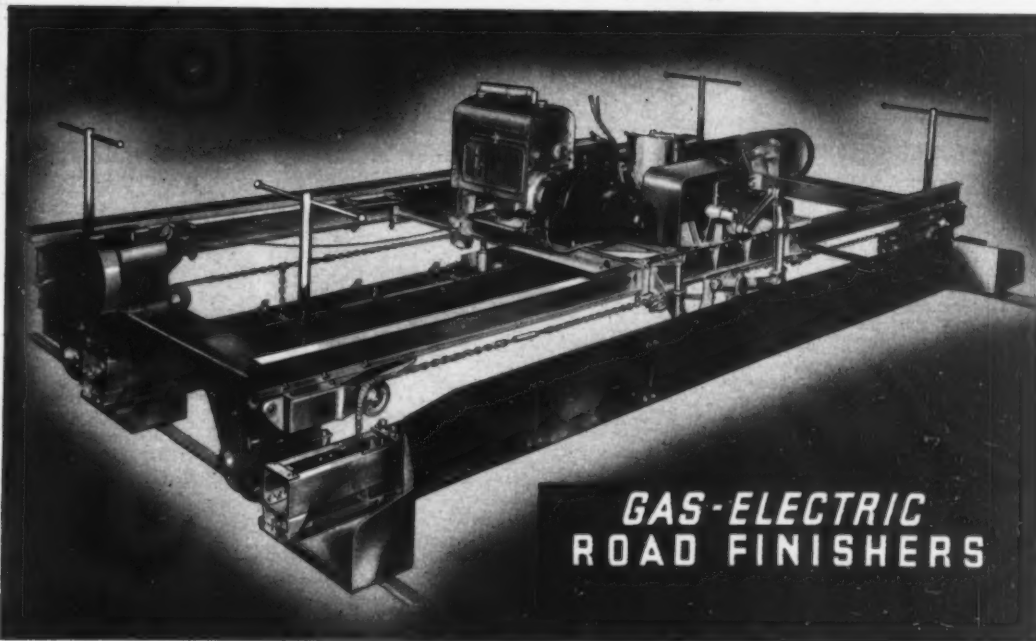
**DIRT MOVERS**



**CLAMSHELL BUCKETS**

# BLAW-KNOX

## ROAD BUILDING EQUIPMENT



**GAS-ELECTRIC  
ROAD FINISHERS**

Yesterday's equipment cannot compete to build today's roads—at a profit. (Here is new equipment, trouble-free and speedy—made to reduce construction costs. It has been tried and proved on many jobs. (Blaw-Knox is ready with this complete line of thoroughly modernized construction equipment—new developments ready to do jobs faster, cheaper and better—tuned to today's construction methods. (Buy new, buy now—insure your profits.

## BLAW-KNOX COMPANY

2086 FARMERS BANK BUILDING

PITTSBURGH, PA.

Offices and Representatives in Principal Cities

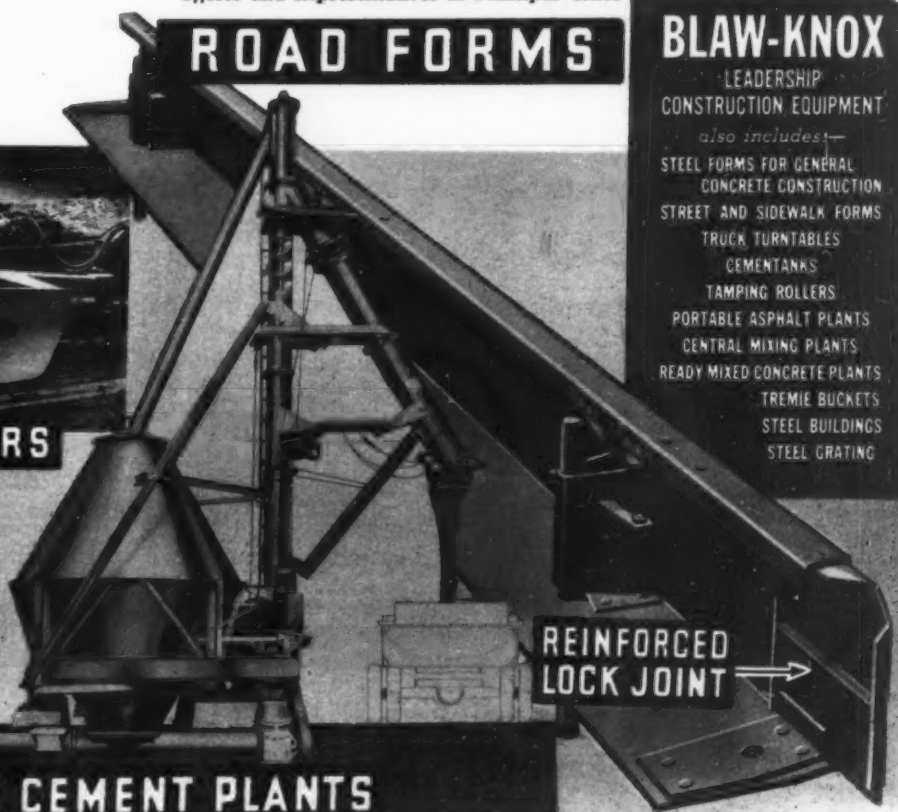
### ROAD FORMS

### BLAW-KNOX

LEADERSHIP  
CONSTRUCTION EQUIPMENT

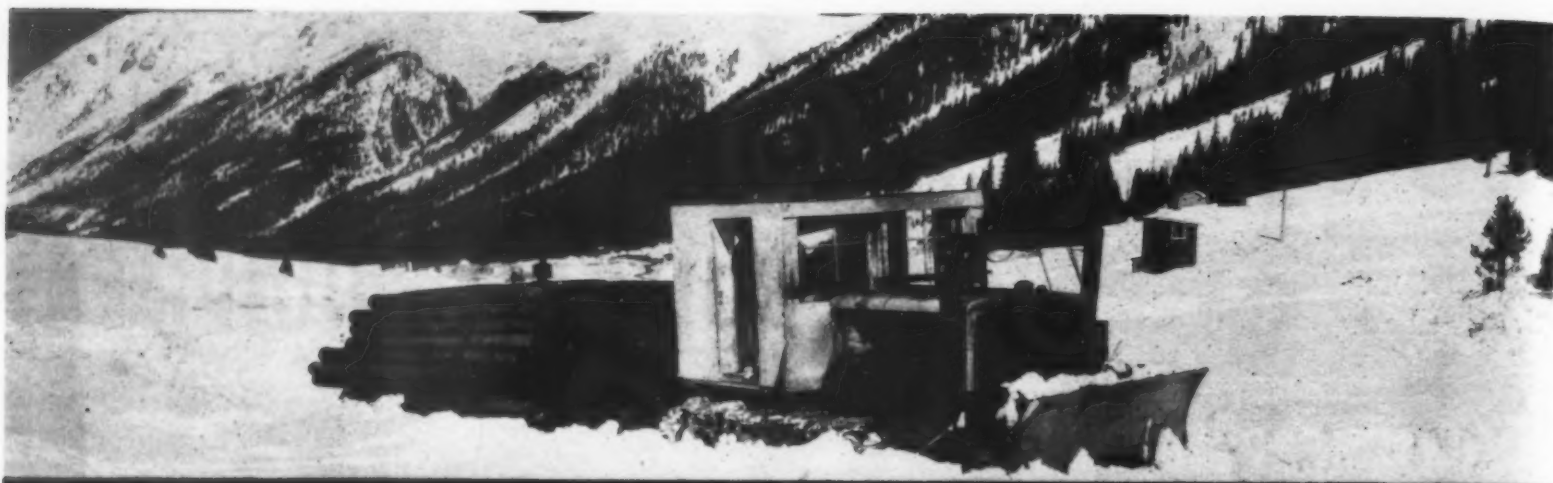
also includes—

- STEEL FORMS FOR GENERAL CONCRETE CONSTRUCTION
- STREET AND SIDEWALK FORMS
- TRUCK TURNABLES
- CEMENT TANKS
- TAMPING ROLLERS
- PORTABLE ASPHALT PLANTS
- CENTRAL MIXING PLANTS
- READY MIXED CONCRETE PLANTS
- TREMIE BUCKETS
- STEEL BUILDINGS
- STEEL GRATING



**BULK CEMENT PLANTS**

**REINFORCED  
LOCK JOINT** →



#### ABOVE

At 11,500 feet altitude, a "Caterpillar" Diesel Fifty Tractor hauls supplies for a Colorado water diversion tunnel job, clearing its own way through snow. Fuel cost is only \$1.80 per 8-hour shift.



#### LEFT

Night and day, this "Caterpillar" Diesel Seventy-Five Tractor hauls 40-ton loads of rock and gravel—low cost material transportation for the construction of the San Francisco-Oakland Bridge.

#### BELOW

Fuel costs for road work in Upsher County, Texas, were cut from \$3.50 to 40 cents per day when this "Caterpillar" Diesel Thirty-Five Tractor went to work.

## "MY 'CATERPILLAR' DIESEL EARNS \$23.86 EXTRA PER DAY"

• • • says a Nebraska contractor who is doing \$16.66 more work per day at \$7.20 less fuel cost than with his former gasoline tractor.

Fuel economy is the feature every owner lists first among the "Caterpillar" Diesel's advantages—the economy of lower price fuel plus lower fuel consumption. Many users find, too, that the "Caterpillar" Diesel with its steady, lugging power does more work per day than their former gasoline tractors. And all owners praise this tractor's dependability, easy and sure starting, simple operation and maintenance. Today, there are more than 2500 users of "Caterpillar" Diesels. There are three tractor sizes available, and three sizes of stationary power units. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



• A M E R I C A   G O E S   D I E S E L   •



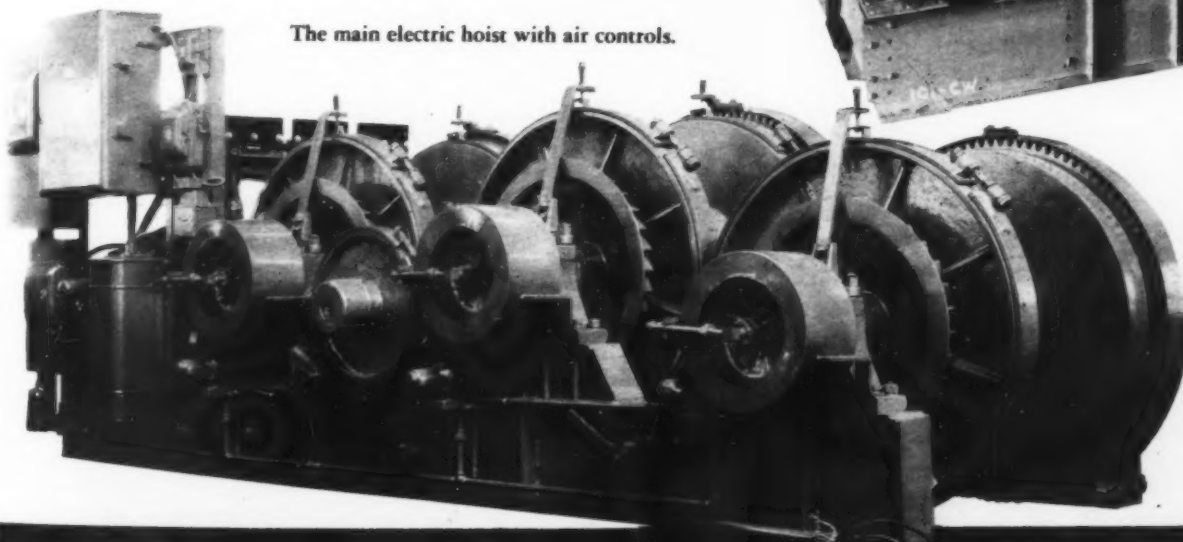
# CLYDE WILEY - WHIRLEYS

One of the six  
Clyde Wiley-Whirleys  
that will place all the  
concrete in the  
GEN. JOE WHEELER  
DAM, - the Tenn.  
River Project at  
Towncreek, Ala.

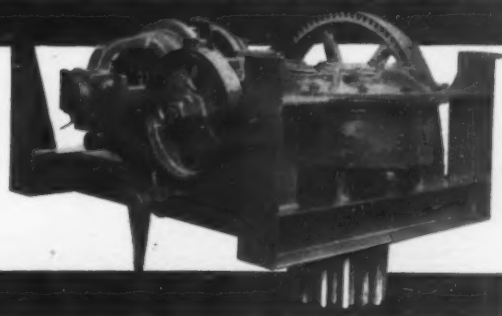
A construction view of the  
Clyde Wiley-Whirley showing  
the frame without the 95 foot  
boom.



The main electric hoist with air controls.



The swinging engine.



**Clyde Sales Co.**  
Duluth, Minn.

# Pioneer Leads The Procession In Progress!



## THE PYRAMID of GIZEH

One of the Seven Wonders  
of the World

*Built 5,000 years ago by King Khufu, the Great Pyramid of Gizeh required 2,300,000 blocks of stone of an average weight of 2½ tons each. 100,000 men worked at it during a period of twenty years. How long would it take present-day constructors with modern methods and machinery to duplicate the pyramid in concrete?*



Pioneer 38-V Duplex Vibrator Plant on the Job

# Pioneer Vibrator Plants



### SPECIFICATIONS OF 38-V PIONEER VIBRATOR SCREENING AND CRUSHING PLANT

4-Wheeled Truck.  
836 Pioneer Bronze or Roller Bearing  
Jaw Crusher.  
30" x 18" Roll Reduction Crusher.  
36" x 120" Vibrator Screen.  
16' Folding Bucket Elevator.  
24" x 50" Feeder Conveyor mounted on  
Low Mast Trailer Truck.  
24" x 20' Folding Delivery Conveyor.

Optional — Delivery Conveyor can be  
installed at right angles to plant, as  
shown in top picture, or in direct line  
with plant. Solid rubber or pneumatic  
tires.

Larger capacity — greater screening area — 10' x 3' vibrator  
screen — Jaw type primary and roll type secondary crusher — low  
pitch conveyors.

Compactness in design — shorter wheel base — lower height — less  
weight — narrower width.

Easy portability — proper road clearance width — folding bucket  
elevator — portable quick acting feeder conveyor.

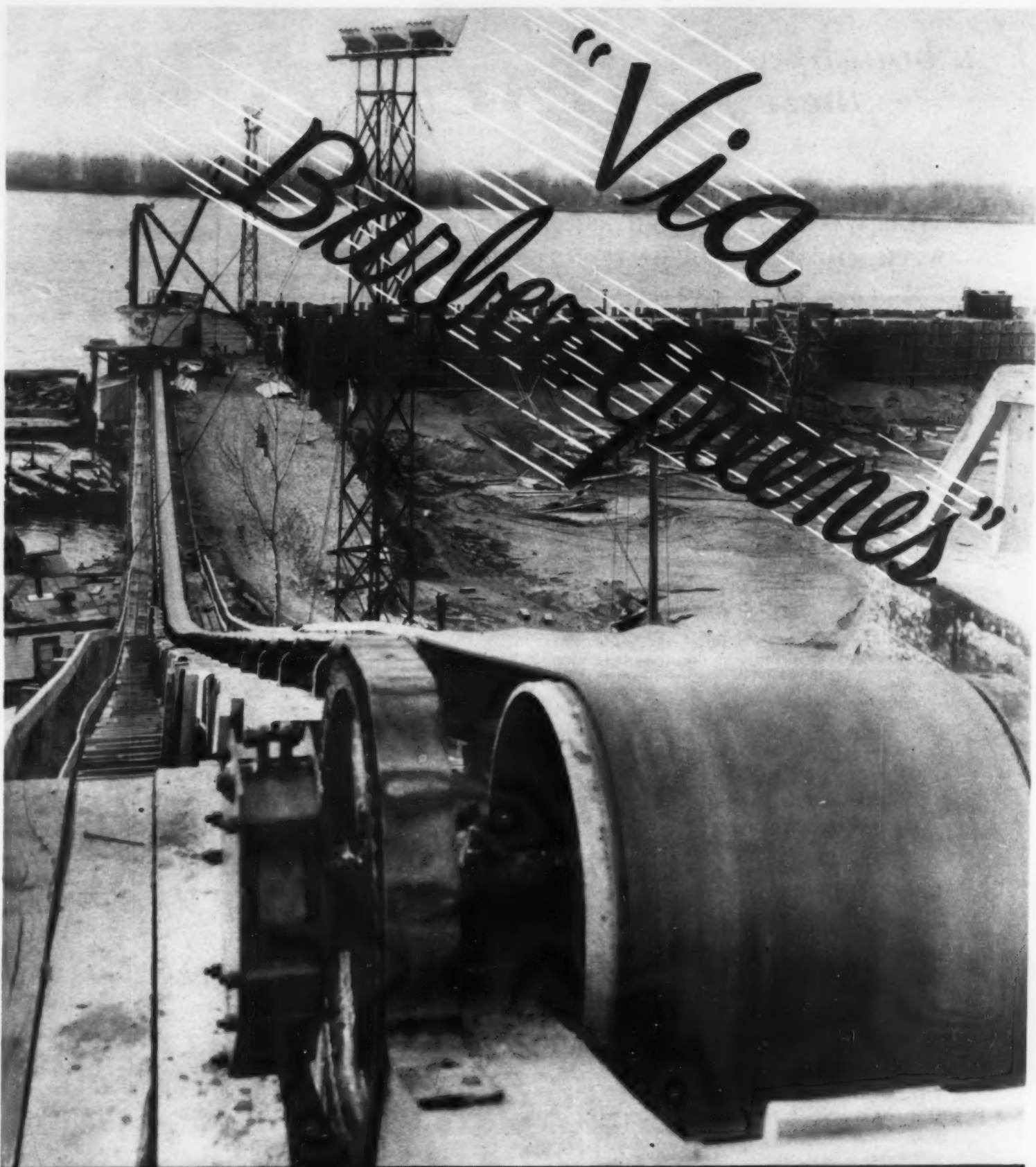
Pioneer Plant owners get the benefit of twice the screening area  
of any competitive plant offered.

Write for new detailed circular on  
PIONEER CRUSHING and PIONEER  
VIBRATOR PLANTS



**PIONEER GRAVEL EQUIPMENT MANUFACTURING COMPANY**  
1515 Central Avenue  
Minneapolis, Minnesota





**S**AY "Via Barber-Greene," and forget that part of your job.

That's what they did here. When the clam shell operator is ready to unload a barge of dredged sand, he throws in the B-G Conveyor switch and starts to work. The sand is automatically conveyed and stored 350 feet away. That's all there is to the operation of this Barber-Greene. This picture reveals only a small part of the handling system on this job, which includes 1,400 feet of belt conveyors.

Standardized Material  
Handling Machines

**BARBER  
GREENE**

AURORA, ILLINOIS

# You bought these *First* from **ATLAS**



ATLAS WAS FIRST IN THE CONSTRUCTION FIELD . . . AND IN ALL FIELDS . . .  
WITH THESE IMPORTANT AND WIDELY ACCEPTED DEVELOPMENTS

*First* **ATLAS  
Accordion  
Fold** 1933



PACKAGING of individual electric blasting caps. The package is compact, handy to carry and easy to open. It protects the detonator from external shock, keeps wires folded accordion-wise so that they may be straightened without tangles and permit easy priming.  
1933—Patented in U. S. and Registration applied for.

*First* **ATLAS  
Match-head  
Type  
Electric  
Blasting Caps** 1919



ATLAS Match-head type Electric Blasting Caps by reason of unique design and method of manufacture establish new standards of simultaneous firing. All pressed detonating charges insure maximum detonating action. The flash composition is firmly shrunk around the bridge resistance wire to insure intimate contact. Efficient insulation of the Match-head assembly is provided. Patented Features.

*First* **ATLAS  
Metal Shunt  
Attachment** 1925



AN IMPORTANT metallic, protective device that short circuits the bare ends of the leg wires of Atlas Electric Blasting Caps and Electric Squibs and guards against firing from accidental contact with conductors carrying stray currents. Patented Features.

*First* **ATLAS  
All-metal  
Delay Electric  
Blasting Cap** 1928



THE ORIGINAL all-metal type. No rubber tube. No fuse. Resistant to moisture and water pressure. Flame filter and baffle. Unequalled accuracy of timing. Patented Features.

*First* **Efficient  
Shunt Wound  
ATLAS  
Blasting  
Machines** 1920  
Dynamo Type 1925



EARLY IN 1920 Atlas introduced to the trade the first correctly designed shunt wound rackbar type blasting machine which is now accepted as standard.

IN 1925 Atlas introduced to the trade the first dynamo type, key-operated blasting machine which has now almost entirely replaced the old magneto type. The Atlas No. 2 Special Blasting Machine excels in capacity, durability and appearance. Efficient blasting machines have contributed greatly to the success and development of electric blasting and modern explosives control.

**ATLAS  
POWDER COMPANY**

A proper explosive for every blasting requirement

WILMINGTON, DELAWARE

Cable Address—Atpowco



# ATLAS

## EXPLOSIVES

### BRANCH OFFICES

Allentown, Pa., Boston, Mass., Denver, Colo.,  
Houghton, Mich., Joplin, Mo., Kansas City, Mo.,  
Knoxville, Tenn., Memphis, Tenn., New Orleans,  
La., New York, N. Y., Philadelphia, Pa., Pittsburg,  
Kansas, Pittsburgh, Pa., St. Louis, Mo., Tamaqua,  
Pa., Wilkes-Barre, Pa.





**CARNEGIE**  
**STEEL SHEET PILING**  
*tells a DIFFERENT STORY*



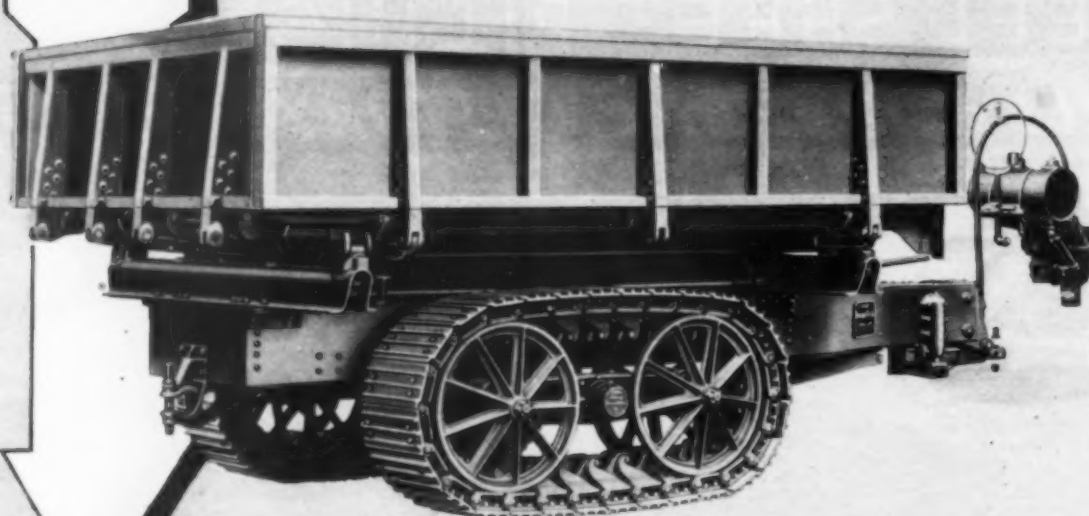
**CARNEGIE STEEL COMPANY**

Subsidiary of United States Steel Corporation  
PITTSBURGH • PA. •

*Right •*

*Left •*

*Rear •*



*The* **LOAD** GOES  
WHERE YOU WANT IT  
*Every Time*



NEW Athey Forged-Trak 3-Way Dump Trailer, furnished in three capacities—7 (8) yard with 15-ton Athey Forged-Trak Wheels; and 9 (10) yards and 12 (13) yards on 20-ton Athey Forged-Trak Wheels.

Rock or sticky mud—dirt or gravel—you'll put the load where you want it *every time* with this NEW Athey Forged-Trak 3-Way Dump Trailer.

It dumps over the fill from either side . . . dumps to the rear . . . spreads material in even layers . . . turns in narrow quarters and is easily backed into position under the dipper.

It makes careful spotting unnecessary because of its low loading height and wide top. A high dumping angle and downfolding gates that open *during the first 17 degrees of lift* assure fast, clean dumping of sticky material.

**ATHEY FORGED-TRAK WHEELS**—the lightest-running wheels on the market—mean lower tractor fuel consumption and dependable operation on any kind of ground. Shocks and impacts of loading and roading are **CUSHIONED** by the spring-mounted chassis . . . spring-mounted frame drawbar bracket . . . and spring-cushioned swivel-type coupling . . . greatly increasing the life of the entire unit.

Only Athey, with its wide experience, its thorough knowledge of field conditions, can give you value like this! For *less* cost per yard—and *more* profits per job—use the NEW Athey Forged-Trak 3-Way.

**ATHEY TRUSS WHEEL CO., CHICAGO, ILLINOIS**  
5631 W. 65th St., Dept. J Cable Address: "Trusswheel" Chicago

**ATHEY**  
**Forged-Trak**  
REG. TRADE MARK

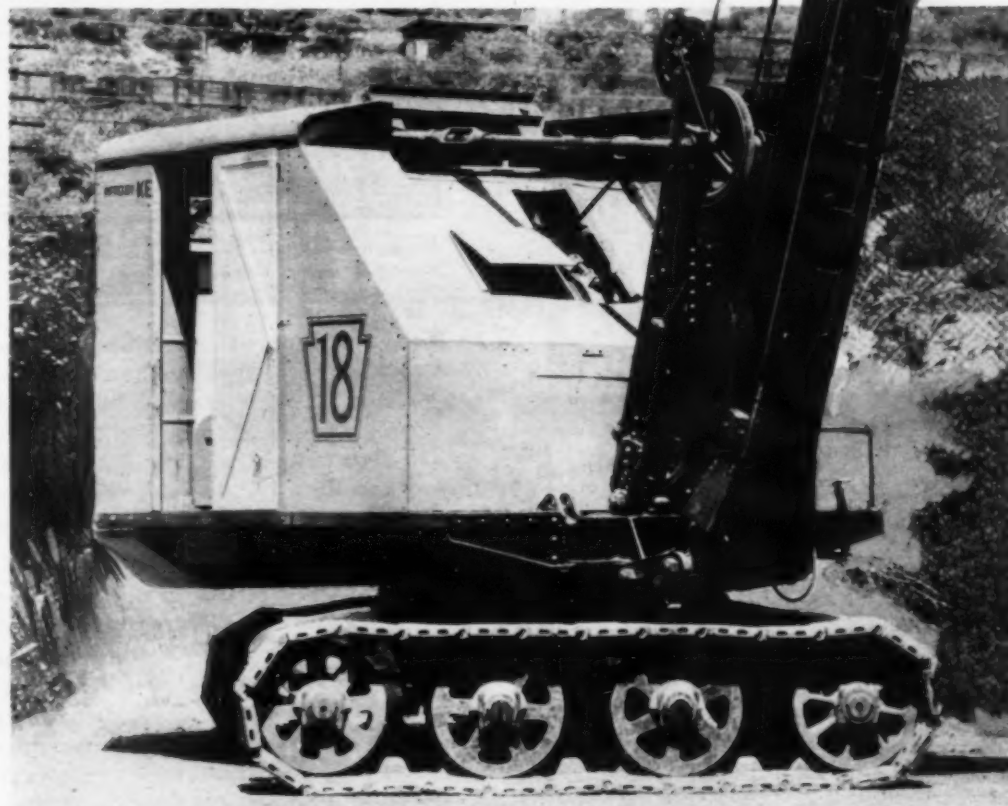


# THE PLUNGER SHOVEL

## EQUALLY EFFICIENT IN DEEP AND LIGHT CUTS

● The new full-revolving Plunger Shovel is an epoch making development of the Skimmer, which was originated and introduced by Keystone in 1913. Unlike the Skimmer, it is as efficient in DEEP as in light cuts. In digging shale and other stratified rock, it has the same advantage over the dipper shovel as in breaking old pavements: — uniformly high hauling force from beginning to end of a straight-line bucket pass. In short, the Plunger Shovel combines, in a superior manner, the advantages of the dipper shovel and the skimmer. Users agree it has, with one stroke, made the century-old dipper type digging device obsolete as a basic shovel utility.

The Plunger may be converted to a Trench Shovel, Crane, or Demolition Hammer, in an hour or two, as no boom change is necessary.



### Big Savings in Light Cuts

Investigation of 100 highway grading jobs in Pennsylvania, Ohio and Illinois, showed that 53.5% of the yardage is in deep cuts where the Plunger is up to 15% faster than the dipper. Also that 46.5% of all the excavation is in cuts averaging less than 4 feet deep, where the dipper is notoriously inefficient; here grading cost with the Plunger is reduced as much as 50%.

### Keystone Builds all Types

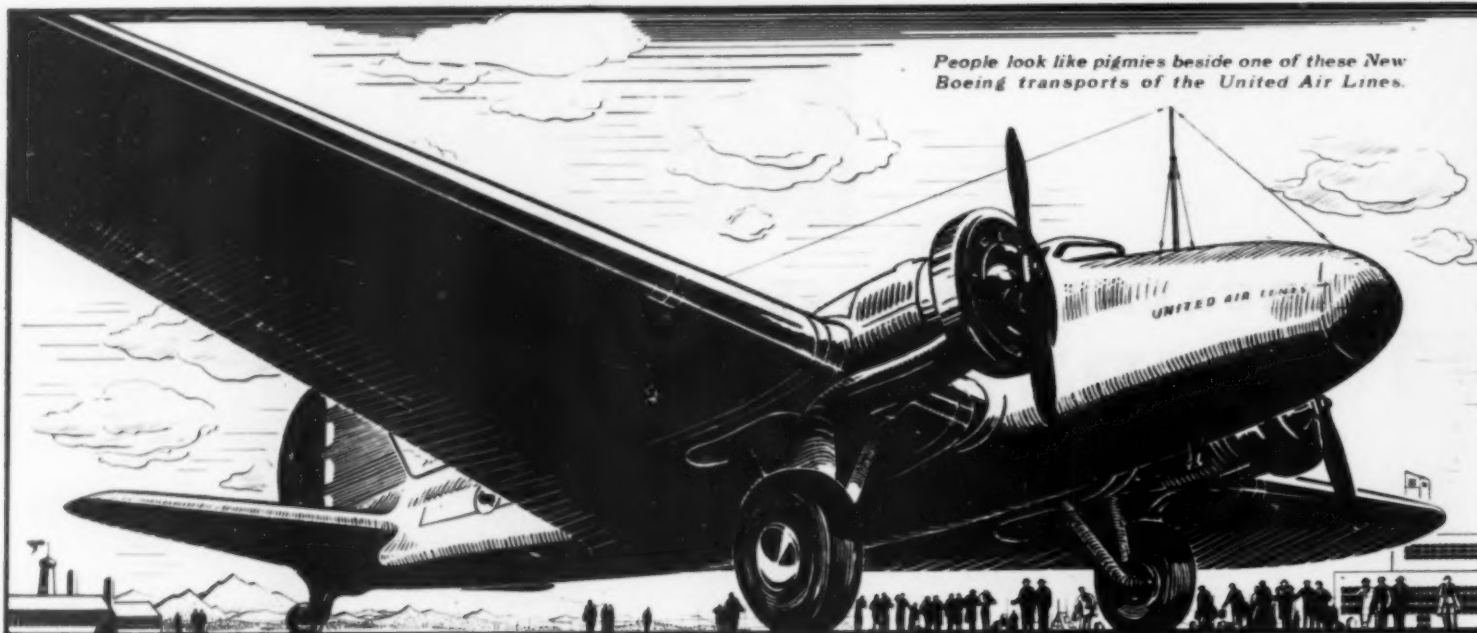
Keystone Model 18 is a full-revolving excavator equipped as a Dipper, Plunger, or Trench Shovel, Hammer or Crane with Clamshell, etc. Making both Dipper and Plunger utilities, we are neutral as to choice. Our only interest is to see that you get the utility which will be most efficient for your work.

Before you bid on another job, send for the full facts as revealed by an exhaustive study of highway grading projects and excavating costs. Just ask for Bulletins Nos. 2 and 3. Keystone Driller Company, Beaver Falls, Pa. (Established 1882). Branches: Arlington, N. J., Birmingham, Ala., Waukegan, Ill., Joplin, Mo.

**DIPPER SHOVEL  
PLUNGER SHOVEL  
TRENCH SHOVEL  
HAMMER • CRANE**

# KEYSTONE





People look like pigmies beside one of these New Boeing transports of the United Air Lines.

# Seventy...

## 3-MILE-A-MINUTE BOEINGS

*World's largest fleet of high speed multi-motored passenger planes equipped with Roebling Control Cable to insure utmost safety*

Now YOU can travel like a shot ...3 miles a minute! California to New York...in 19½ hours! United Air Lines new fleet of 70 Boeing Wasp-powered transports makes this possible.

Just imagine yourself as one of the two pilots at the controls of one of these air giants....

speeding through the air...a mile in almost 20 seconds! You would want to feel mighty sure of those control cables!

And this is how Boeing felt about it...when they designed these planes. So they equipped all 70 with Roebling Control Cable.

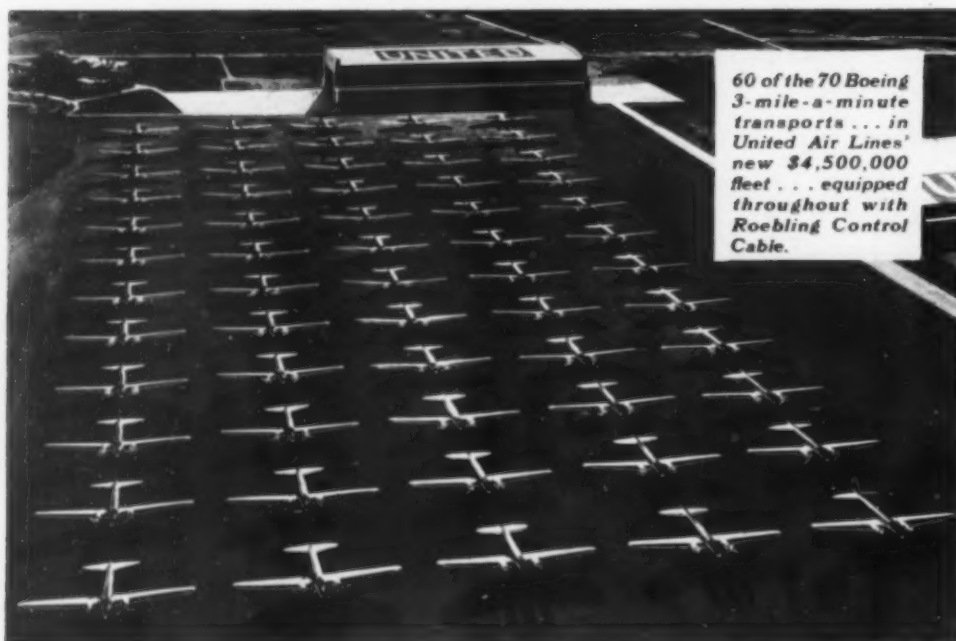


Target-towing...an interesting and severe use for Roebling Control Cable. Only ¼ in. in diameter, this tough cable has an ultimate strength of 1 ton.

You may not use Roebling Control Cable. But you can get the same stamina and safety in other Roebling Wire Products...including Wire Rope. Through the use of these products you have positive assurance of the utmost of dependability and economy in service.

**WIRE ROPE FOR ALL NEEDS...**  
**LARGE OR SMALL:** No matter how exacting the service, or how large or small the order may be, Roebling can meet your requirements. And your order will receive the same careful, prompt attention, whether for a carload of rope or merely a few feet. John A. Roebling's Sons Company, Trenton, N.J. Branches in Principal Cities.

**ROEBLING**  
*The Pacemaker in  
Wire Rope Development*



60 of the 70 Boeing 3-mile-a-minute transports...in United Air Lines' new \$4,500,000 fleet...equipped throughout with Roebling Control Cable.





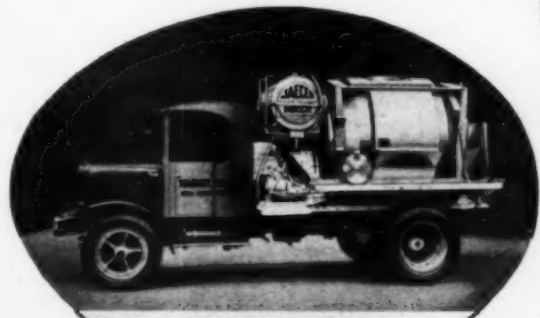
## BUILDING

Foundations,  
Piers, Bridges,  
Floors, Conduits,  
Buildings and  
All General  
Concrete Work!

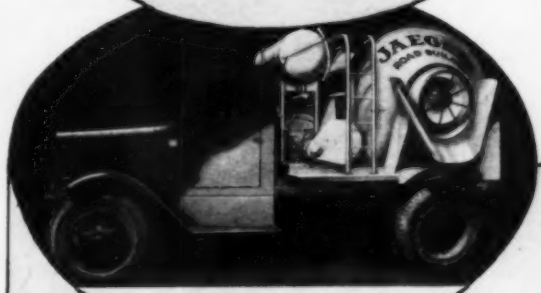
**Every Job's a Jaeger Job in 1934**

## PAVING

and Widening  
Streets, Roads,  
Alleys, Curb  
and Gutter  
Work, Sewers,  
and Sidewalks



END DISCHARGE



SIDE DISCHARGE

**B**IG jobs and small ones, general construction and road work—they're all using Jaeger Truck Mixers this year to get lower costs and "Dual-Mix" higher strength concrete.

Producers and contractors have agreed that Jaegers are faster, get bigger yardage, cost less for upkeep, are more efficient in meeting job conditions. Built in both side-discharge and end-discharge types, 1 to 5 cubic yard capacities. Write for prices, full details to THE JAEGER MACHINE COMPANY, 800 Dublin Avenue, Columbus, Ohio.

## RENTED BATCH TRUCKS MAKE THE LONG HAULS

On road work or suburban deliveries, use Jaeger Transfer Loader. Keeps Truck Mixers on short hauls. More trips per day, more yardage.



# CHEVROLET TRUCKS



*speed up the work and cut down the cost  
of developing the*

**TENNESSEE VALLEY**



Muddy going after rain, but Chevrolet trucks get away under full load without trouble. Chevrolet provides truck pulling power.



Faster round trips keep men and equipment busy. Chevrolet overhead-valve engines develop maximum power at normal hauling speeds.



Ready for any job. Chevrolet trucks save money on every haul, empty as well as under full load.



Chevrolet trucks provide the lowest final gear ratio (rear axle and transmission combined) of any 1½-ton truck.



Chevrolet truck axles can "take it." Straddle-mounted pinion, 4-pinion differential, big axle shafts, double-row wheel bearings are a few of the rear axle features.



Uses for Chevrolet stake trucks are endless. Easy to load and unload, and most economical for every hauling job.



A fleet of Chevrolet trucks—the world's lowest-priced Sixes—keeps big loads coming fast on operations like this.



Worse mud than this doesn't stop Chevrolet trucks. The rear axle is built with extra strength throughout, for dependability in heavy pulls.



Chevrolet "pick-ups" are always busy, moving needed tools and supplies without waste of time.



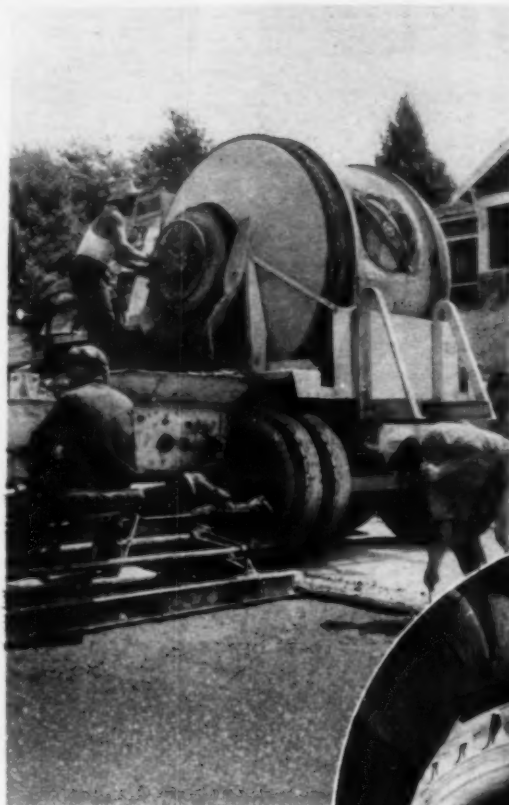
Chevrolet half-ton or 1½-ton trucks, with standard or special bodies, can fill all transportation needs.



Loads of every size move faster and at lowest cost in Chevrolet stake trucks—an all-purpose truck for any project.



# NEW TRUCK TIRE PREVENTS BIG CAUSE OF SIDEWALL BREAKS!



No longer any need to have truck tires fail long before the tread is worn out! The sidewall was the "Failure Zone" of truck tires for years. Under heavy loads tires went to pieces in a hurry. No need for that now! The new Goodrich Silvertown is Triple Protected against sidewall failures. Here's a tire that can stand the hard knocks on a construction job. It is just as strong in the sidewall as it is under the tread!

Road tests tell the story. Special tires were built, one-half of each with Triple Protection, one-half with ordinary construction. Every tire was run until it failed. Every tire failed in the half made the ordinary way. Not one break with Triple Protected construction!

You can get more mileage from truck tires on dirt moving jobs. The new Triple Protected Silvertown is positively protected against sidewall failures. With ordinary tires the cords may rub, generate heat, then snap. The short plies above the bead often tear loose. That's what causes sidewall breaks. And that's why Goodrich developed Triple Protection to stop this waste. Here is a sure check against 80% of premature failures!



## Only Goodrich offers this Triple Protection:

- 1 PLYFLEX**—is a new tough, sturdy rubber material. Every Silvertown truck tire has a layer of Plyflex protecting the sidewall. It distributes the stresses and strains. It prevents local weakness.
- 2 PLY-LOCK**—The short trouble-causing plies in ordinary tires often tear loose just above the bead. In Silvertowns, the plies are "locked" about the beads—anchored in place... The tapered ply ends are floated in rubber.
- 3 100% FULL-FLOATING CORD**—Each cord is surrounded by rubber. With ordinary cross-woven fabric, when cords touch each other they rub—get hot—break. In Silvertown there are no cross cords. No friction. Fabric wears longer.



Where loads are heavy—where the going is tough—Triple Protection gives you full mileage. Forget unnecessary failures. Avoid delays and accidents. Cut repair bills. Save time. Ask any Goodrich truck tire dealer to show you this amazing tire. It costs no more than any standard truck tire.

**FREE!** Valuable Book—48-page Safety Manual. Tells how to save money—build good will for your fleet. How to organize the Silvertown Safety Award Plan. How to get free Safety Awards. No obligation. Write Dept. T-111, The B.F. Goodrich Rubber Co., Akron, Ohio.



# Goodrich *Triple Protected* Silvertowns

## FOR TRUCKS AND BUSES



Pump illustrated is  
LaBour No. 15 WPD

## It Pays to Look a Little Further

When you invest money in pumping equipment look *beyond* the manufacturer's claims for performance and economy. Find out *why* the pump operates as it does; see for yourself that it is based upon a sound principle.

LaBour pumps prime themselves without the use of valves, floats, springs or adjustments of any kind. This revolutionary simplicity is possible only because of the patented and exclusive principle called



Only this principle makes possible the operation of the self-priming centrifugal pump which is as trouble-free and as dependable as the common non priming centrifugal pump. There is no substitute for HYDROBALANCE and it means real money to you to buy a pump which will deliver its rated capacity under all conditions of suction lift and which is immune to the difficulties which arise from a multiplicity of moving parts.

Send for a detailed description of the LaBour line and an explanation which will enable you to understand why LaBour pumps are more dependable and offer greater economy of operation than any other self-priming centrifugal pump known today.

**THE LABOUR COMPANY, INC.**  
609 Sterling Ave.  
ELKHART, IND.

## COLT CONCRETE FORM EQUIPMENT

(Malleable Iron)

for bridge decking and abutments,  
dams, disposal plants, columns, etc.



Colt Wedge Clamps, Colt Cones and Colt Nut-Washers are simple to assemble. Made-up on the bench and pushed through the forms *from the outside*. Spreading is also done from the outside with nails.

Colt Concrete Form Equipment is *practical, positive* and the most *economical* means of holding forms yet developed. It may be made up in many combinations to meet the requirements of every job. Cones are removed with ease either before or after forms are stripped or concrete is fully set leaving all metal two inches from surface.

All Colt Clamps, Cones and Nut-Washers are used over and over indefinitely leaving only cheap rods in concrete.

Manufactured by

**FREDERICK N. RITCHIE CO.**  
113 No. Centre St. Orange, N. J.



### SAUERMAN SLACKLINE CABLEWAY

A powerful excavator and a rapid conveyor. • Digs, hauls, lifts and dumps in one, continuous movement. • Operated by one man. • Complete range of sizes for small or large jobs.

Write for catalog.

## HOW to Dig and Convey Wet Materials for a Few Cents per Yard

Many excavating jobs that are costly to handle with other excavating equipment are relatively simple for a Sauerman Slackline Cableway.

This machine is able to reach across a river, pond or pit of any width up to 1500 ft., dig to a depth of 100 ft. or more and move the excavated material in a straight-line operation to an elevated receiving hopper or storage pile at the rate of 30 to 40 bucket-loads per hour.

Consequently, a Sauerman Slackline Cableway has a great natural advantage over other machines on such work as cleaning out reservoirs, constructing earth dams, dredging gravel from rivers and deep pits, etc., because only one handling of the material is necessary when a Sauerman machine is used.

SAUERMAN BROS., Inc. 480 S. Clinton St., Chicago



Sauerman Cableway at left is shown digging a tail-race 1700 ft. long. Contractor saved \$75,000 on this job by using cableway.



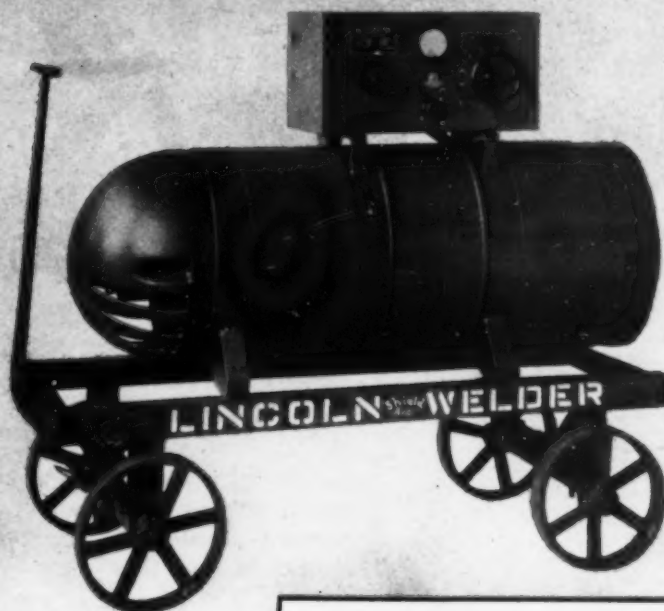


*"These welder salesmen  
have me confused with their  
claims."*



*"Compare their machines  
with the Lincoln 'Shield-  
Arc'—then you'll have the  
salesmen confused. The  
'Shield-Arc' sells itself."*

# HERE'S WHAT YOU NEED IN A WELDER



## For faster welding—for better welds—for lowest welding costs

Time and again competitive tests have proven that only the Lincoln "Shield-Arc" has what it takes to produce the highest quality welds at a speed which drives production costs down to a new low . . . no matter whether you figure the cost per lineal foot of weld, or per pound of weld metal or per hour of welding. That's why there are more Lincoln welders in use today than any other make of welding generator.

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Arc welding is saving industry millions of dollars annually. Be sure you are getting all the savings arc welding can give you. Find out now how much more Lincoln can save you with a "Shield-Arc" welder.

# LINCOLN

### TO BE MODERN . . . A WELDER MUST HAVE THESE FEATURES

1. Uniform Current
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3. Sparkless Commutation
4. High Efficiency
5. Remote Control  
(without portable accessories)
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**"SHIELD-ARC"**  
has them all

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THE LINCOLN ELECTRIC COMPANY, Largest Manufacturers of Arc Welding Equipment in the World, CLEVELAND, OHIO

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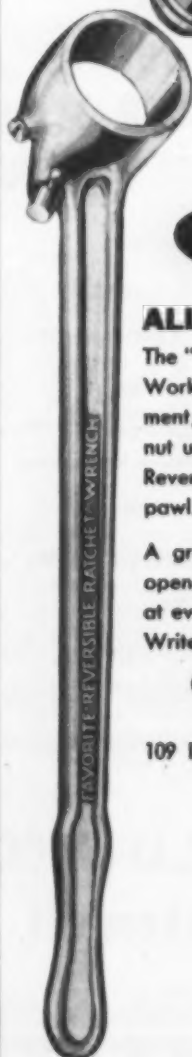


**THE IMPROVED MODEL**  
of the  
**"FAVORITE" reversible ratchet WRENCH**  
is a better wrench because of the new metal in the Handles, Heads and Pawls.



The handles and heads have been regrouped so that all awkward combinations and duplications have been eliminated.

Old heads and handles are interchangeable in new model.



**ALL LOST MOTION AVOIDED**

The "FAVORITE" reduces the cost of nut turning. Works on a quick straight-ahead ratchet movement; socket form of head is not removed from nut until operation is completed. Reverse motion instantaneous by simply turning pawl.

A great saving in time over the old-fashioned open-end type, which must be removed from nut at every quarter turn, with possibility of slipping. Write for full particulars.

**GREENE, TWEED & CO.,**  
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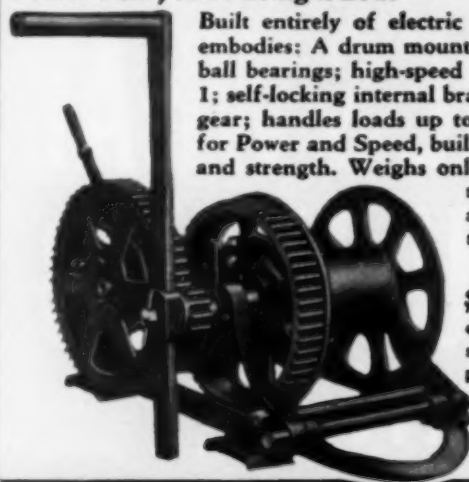
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New York



# 5 TON HANDY HOIST

THERE'S a job of hoisting, hauling, loading or lifting which Handy-Hoist can do cheaper, faster and a lot safer than you're doing it now.



Built entirely of electric steel, Handy-Hoist embodies: A drum mounted on grease-sealed ball bearings; high-speed gear ratio of 24 to 1; self-locking internal brake on intermediate gear; handles loads up to 5 tons. Designed for Power and Speed, built for maximum life and strength. Weighs only 125 lbs., permits mounting and operating in any position.

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Most Light  
from least Carbide  
Quickly Charged

Easily moved—No wires  
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No waste Carbide whether used  
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No harm done if tipped over



Extension to  
X-100  
DOUBLES THE  
CANDLE POWER  
fastens anywhere

Always use  
NATIONAL  
CARBIDE  
"In the Red Drum"  
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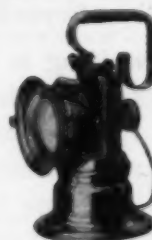
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NATIONAL CARBIDE V-G LIGHT  
About 8,000 c.p. for 12 hours on  
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Easily handled by one man. Weight  
35 lbs. empty; 90 lbs. full.

WRITE FOR  
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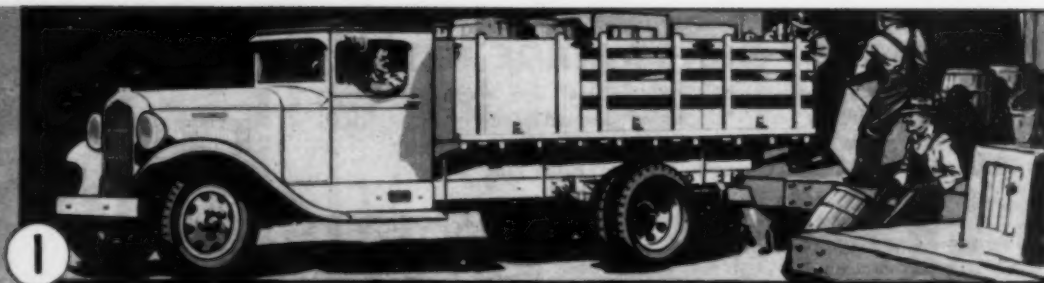
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NATIONAL CARBIDE  
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Burns about 3 1/2 hours  
on 1 1/4 lbs. of 14-ND  
Carbide, 2 gals.  
water; delivers about  
1500 c.p. Weighs 37  
lbs. charged—easy to  
carry, handy in emer-  
gencies.



**WL1-C1**  
NATIONAL  
CARBIDE LANTERN  
Burns 8 hrs. on 8  
oz. of Carbide. Bril-  
liant rear signal of  
red, blue or green,  
no extra charge...  
Ideal for emergency  
lighting on road at  
night.



# 5 REASONS FOR SPECTACULAR GAINS IN REO TRUCK SALES



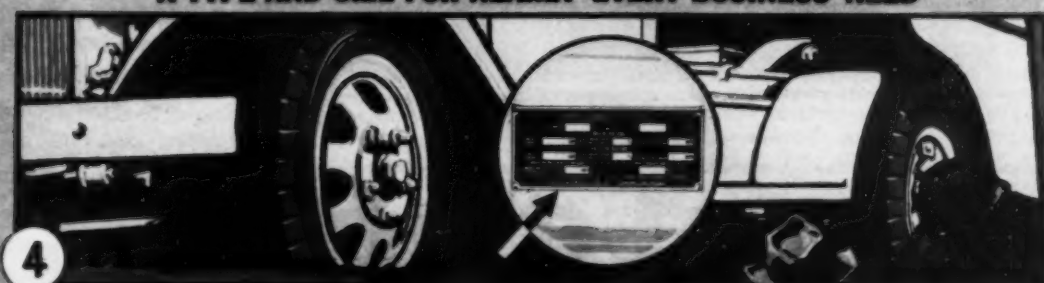
**BIGGER PAY LOADS—MORE TON MILES**



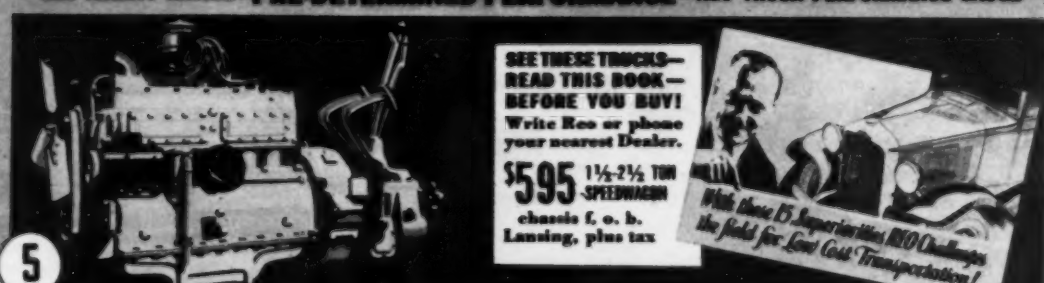
**LONGER LIFE—LOWER OPERATING COSTS**



**A TYPE AND SIZE FOR NEARLY EVERY BUSINESS NEED**



**REO ABILITY RATING—PRE-DETERMINED PERFORMANCE—REO TRUCK PERFORMANCE CHART**



**REO-BUILT 6-CYL. GOLD CROWN ENGINE—15 OTHER PROVABLE SUPERIORITIES**

**SEE THESE TRUCKS—  
READ THIS BOOK—  
BEFORE YOU BUY!**  
Write Reo or phone  
your nearest Dealer.  
**\$595** 1½-2½ TON  
SPEEDWAGON  
chassis f. o. b.  
Lansing, plus tax



Two words contain the answer to Reo's spectacular gains in truck sales: **UNPRECEDENTED VALUES!**

Not even Reo has produced such values before—and Reo has a reputation for extra-value-building that dates back 30 years!

The 1½-2½ ton Reo Speedwagon now costs only a few dollars more than the cheapest trucks on the market—and has quality features that easily rank it with the most expensive.

Operators who demand the most for their

money find that it pays to look *beyond the purchase price*. They figure the cost in terms of ton-miles instead of thinking only of the original price.

On this basis, Reo naturally continues to gain. Any fair comparison is too much in Reo's favor to escape the buyer who is looking for **FACTS!**

*Reo Speedwagons and Trucks range from ¾ to 4-6 tons. New low prices—\$530 and up. 32 wheelbases, all with Reo Gold Crown Engines. Tractor-Trailer units with correct load distribution and maximum pay load capacity. All prices chassis f. o. b. Lansing, plus tax. Dual wheels extra.*

**THE QUALITY TRUCK IN THE LOW PRICE FIELD**

**REO MOTOR CAR COMPANY, LANSING, MICHIGAN**

## LOW COST ROADS MADE NEW

If you have trouble with "chuck-holes" and wavy surfaces on your asphalt, "black-top" and all kinds of bituminous roads and streets, you can get quick results by cutting up the surface with a Baker Road Disc without disturbing the road base.

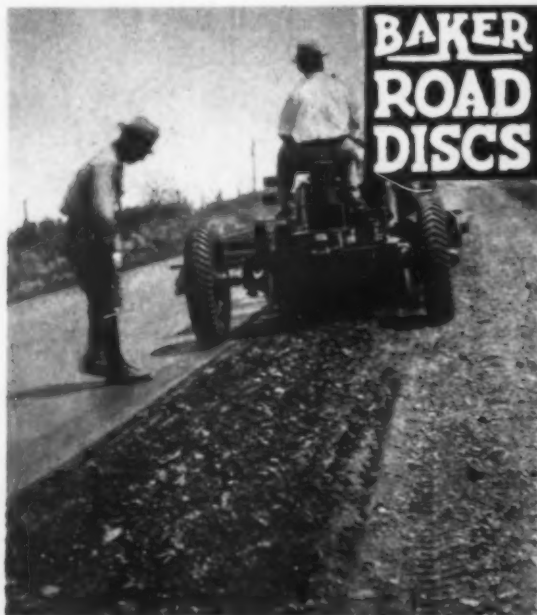
..It is the new kind of scarifying now adopted by leading State Highway Departments, counties, cities and paving contractors.

..Send for descriptive Bulletins telling about Baker Road Discs.

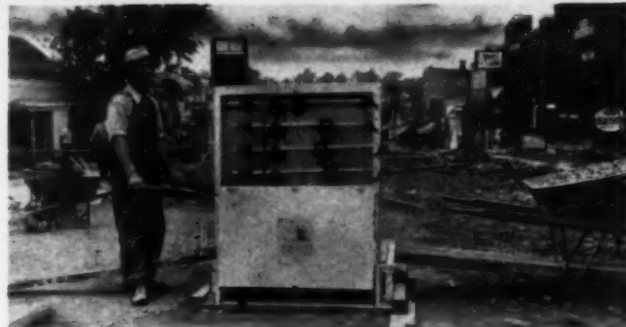
**THE BAKER MANUFACTURING CO.**

568 Stanford Avenue

Springfield, Illinois



## Two Scales to put MORE PROFIT in Every Job

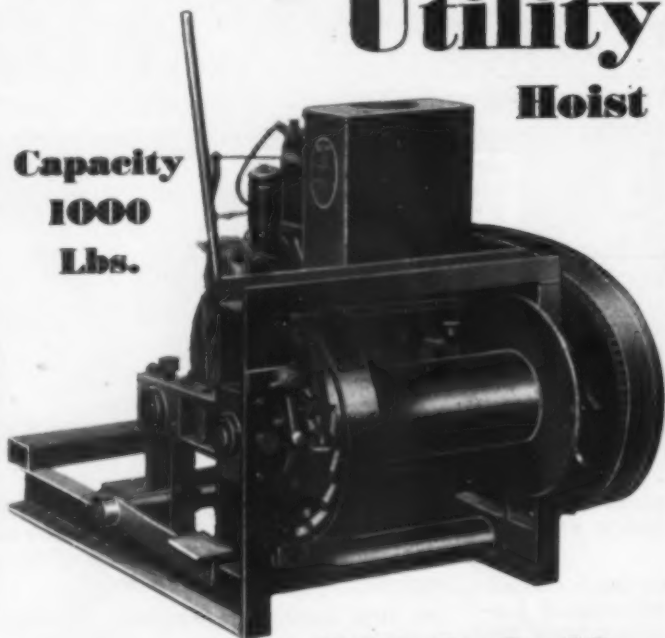


### Fairbanks Wheelbarrow Scales

The weighing of aggregate is a highly progressive step forward in the mixing of concrete. Accomplishing all the desired results of scientific mixing by engineers' formulae is made possible by the use of Fairbanks Wheelbarrow Scales. With them time and labor are saved, quality of concrete is safe-guarded, and absolute uniformity is assured. Hundreds of contractors are using these scales and meeting rigid specifications without increasing labor cost of mixing. There are three types of these scales. No obligation attends your inquiry for further details.

## Utility Hoist

Capacity  
**1000  
Lbs.**



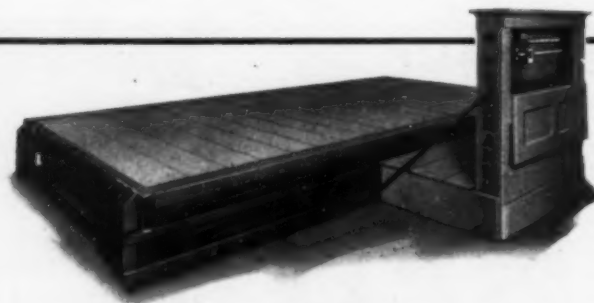
2 H.P. Hoist  
Novo Model AH  
Single & Double Drum

**\$209.<sup>00</sup>** F.O.B. Lansing

The Novo Model AH is an all electric welded steel Hoist powered with the Novo Timken Roller Bearing equipped 2 to 4 H.P. Engines or Electric Motors. Send the Coupon. Novo Hoists range in size from 2 to 150 H.P.

**NOVO ENGINE COMPANY**  
214 Porter Street Lansing, Michigan

Send me full information on the Novo Model AH Utility Hoist.  
Name .....  
Address .....



## A Truck Scale you can take to the job

Again, Fairbanks, by closely watching the needs of the industries it serves, produces a scale which fits exactly the requirements of contractors.

For checking receipt and disbursal of aggregates—for weighing aggregate as a basis of payment for the job (a growing practice in many states)—Fairbanks has produced a self-contained Truck Scale which can quickly and easily be dis-assembled and transported from job to job. On a paving project, for example, this scale can be advanced along the job with the mixers or pavers.

Full descriptive literature may be obtained by writing nearest branch, or Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. And 40 principal cities—a service station in each house.

**Fairbanks Scales**



6041 SA 31-13



**"REVOLUTIONARY!"**  
**"OUTSTANDING!"**  
**"ECONOMICAL!"**  
**"APPROVED!"**

# are the verdicts on soil-stabilized roads

● HIGH construction costs are no longer an unassailable excuse for withholding the much-needed improvement of thousands of miles of secondary highways used by a very large percentage of the citizens of every state. "Soil stabilization" has been definitely proved a highly successful — and amazingly economical — method for producing a hard, all-weather type of road surface. Here are a few of the many statements on record showing that most any county or community can afford "soil-stabilized" roads:

## **"It will revolutionize secondary road building"**

"We think so much of this new type of road that personally I am convinced it will revolutionize secondary road building in this country. The principles involved in its construction are so simple that it is a marvel they haven't been adopted widely before this. Of course, new applications of Calcium Chloride must be made at intervals, but the maintenance cost of the new road will compare favorably with other surfacing requiring an initial construction investment three times as great. All in all, such are the advantages to be gained from this type of road that we are questioning, not its expediency, but whether we can afford *not* to build it."—C. W. McClain, Chief Engineer of Highway Maintenance for Indiana.

## **"Land-owners approve Calcium Chloride roads"**

"In 1932 we constructed fifty miles of stabilized gravel roads. This construction was so satisfactory that the 1933 program was confined wholly to this type of road. By the end of 1933 a total of 335 miles had been completed, furnishing employment for as many as 6000 workers. The complimentary attitude of the public is gratifying. We have many letters from land-owners along these roads, emphasizing their approval of them and requesting that we do not change this type in the future. We are more than satisfied with our results for we feel that we have furnished the taxpayers with well-drained, properly aligned, usable roads which can be developed into high-type roads at rela-

tively low cost when conditions warrant."  
—R. B. Traver, County Engineer, Onondaga County, N. Y.

## **"The most outstanding development in highway engineering"**

"Undoubtedly the most outstanding development in highway engineering in the past year was the development of soil stabilization practice, whereby, through the combination of soils having varying characteristics, a firm and stable road surface is obtained. In this method clay is incorporated in existing sand or gravel by scarifying, pulverizing and mixing; and after shaping and dampening, a relatively small amount of Calcium Chloride is added. For a road in Michigan the total cost of such work amounted to 3.6c per square yard, or \$381 per mile, including rental for the equipment used. . . . Not only do such types provide a satisfactory road surface

for present use, but as traffic increases, surface treatments, or mixed-in-place, re-tread, concrete or other pavements can be placed on them at a relatively small expenditure."—From discussion on "Low-cost Road Construction" in March, 1934, issue of "Public Works."

## **"An economical investment"**

"This type of low-cost gravel street is an investment that amply fulfills the need of residence districts having moderate traffic. It can be easily maintained in a smooth condition at a low expense. Retention of Calcium Chloride is more satisfactory in this type of surface than when ordinary unbound gravel is used. Thus a continuously dustless surface is provided at low cost."—Karl B. Robertson and D. N. Smith, City Engineer and Construction Engineer respectively, Midland, Mich., in "American City Magazine," May, 1933.

## **"A good road summer and winter"**

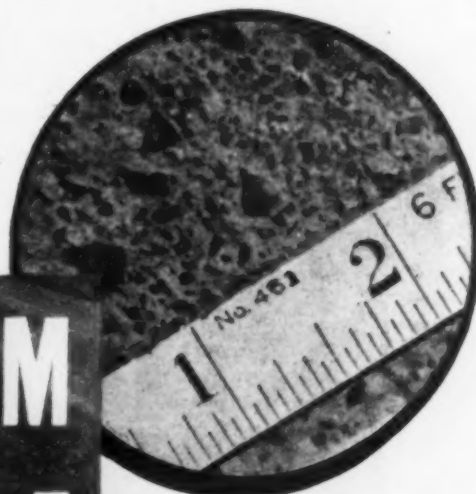
"The surface remained in good condition through the summer and required no patching except in a few places along the stabilized material. There was no deterioration or slipperiness through a very wet fall, and this uniformly good condition extended into the winter."—L. L. Bateman, County Engineer, Huron County, Mich., in "Better Roads," May, 1933.

● Add to such emphatic approval from reliable sources the fact that "soil-stabilization" has had the benefit of wide research by the U. S. Bureau of Public Roads, and of thorough trial in hundreds of instances, and little doubt remains that this is the type of low-cost road for the future as well as for the immediate stretching of curtailed highway budgets. Every county engineer and other highway official should become fully acquainted with this modern development. Write for free literature. Address any of these members of the CALCIUM CHLORIDE ASSOCIATION:

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THE COLUMBIA ALKALI CORPORATION  
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Midland, Michigan



# CALCIUM CHLORIDE



**for stabilizing  
road surfaces**

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**Locher's  
popular articles**

# HELPS TO SUCCESSFUL CONTRACTING

by **HARRY O. LOCHER**

*Vice President, Locher & Co., Inc., Assistant Deputy Administrator,  
Construction Division, National Recovery Administration*

222 pages, 5½ x 8, \$2.00

**H**ERE is an unusual collection of practical helps, suggestions, and examples that can be translated into profits in the contracting and construction organization. With strong emphasis on the importance of human relations, it interestingly covers many ideas and details of management that can be applied to promote cooperation and efficiency with benefit both to the individual and to the organization.

This is one of the most unusual books ever presented to the contracting and construction field. For, while it covers every phase of the work, from estimating and bidding to cleaning up and moving to the yard or a new job, it is no stereotyped review of construction methods.

Instead it takes up a great many details that lie outside the actual moving of earth, setting of steel, or driving of piles—less tangible elements of cooperation, management, understanding and efficiency—details that are frequently overlooked but that have a strong bearing on results and profits.

## Simple—understandable—practical

The treatment is distinctly practical. It deals with problems that concern every contractor, talks to the construction man in his own language, offers suggestions that are within the ability of any organization to apply.

Important factors in bidding for and entering into a job—morale of the organization and how to maintain it—profit angles in field work, handling equipment, dealing with sub-contractors and engineers—bonds, contracts, bids, costs, safety—and a host of other topics are covered in a refreshing way and with helpful ideas and illustrative examples on every page.

## Based on real construction experience

What the author has to say, the incidents and examples used to illustrate his ideas, are drawn from a background of more than 30 years' practical construction work on such jobs as Weston Aqueduct in Massachusetts, West Neebish Channel in Michigan, levee work on the Mississippi, Shoshone Dam, snow shed work for the Great Northern, pier work in San Francisco Bay, subway work in New York, etc.

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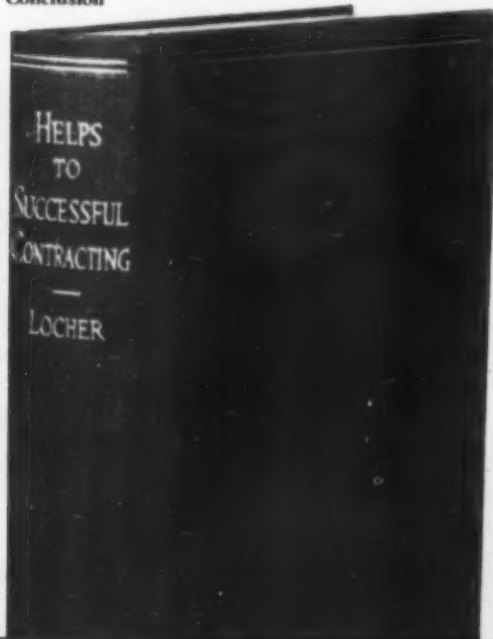
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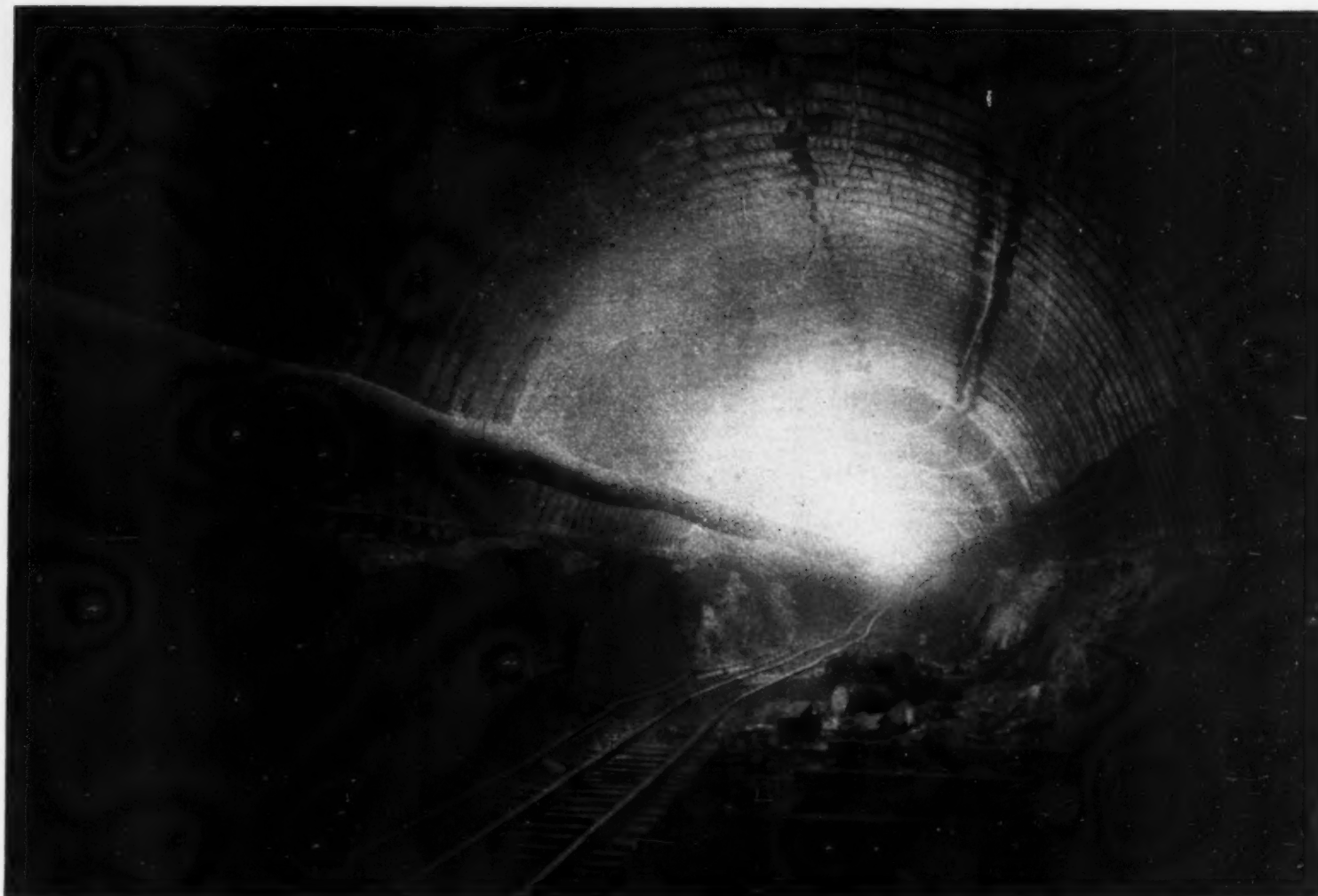
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*Presents usable ideas and methods  
on many topics under these  
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Construction Equipment and Methods  
Selecting an Organization  
Cost Keeping and Records  
Equipment  
Sub-contractors  
Progress Schedules  
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Bidding Methods  
Moving to Yard or New Job  
Accident Prevention  
Conclusion







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Construction engineers working against time have learned that du Pont "Ventube" is the basis of the ideal ventilating system.

It is quickly installed. One man can hang 200 feet in an hour.

It delivers air with a minimum of loss and friction.

Ventube speeds up operations through the speed with which it can be brought up to the working face to clear away gases after blasting.

It is tough, durable, laboratory developed to serve under widely varying climatic conditions.

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Ventube has been used in tunnel driving the world over.

Competent advice on the use of Ventube will be given on request.

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9 sizes —  $\frac{3}{8}$  to  $1\frac{1}{4}$  cubic yards. Shovel — Dragline — Clamshell — Crane — Trench Hoe — Skimmer

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*that a man can easily carry*

The Homelite portable, self-priming centrifugal pump weighs only 89 pounds; can easily be carried by one man. It is a complete unit with a built-in gasoline engine. Pumps from 2 to 7500 gallons per hour. Handles muddy water with solids. Primes quickly.

Thousands of Homelite Pumps are in service on construction jobs all over the world. Write for descriptive bulletin.



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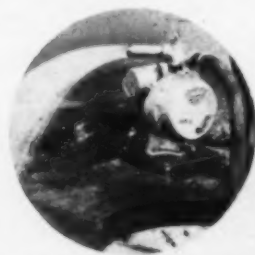
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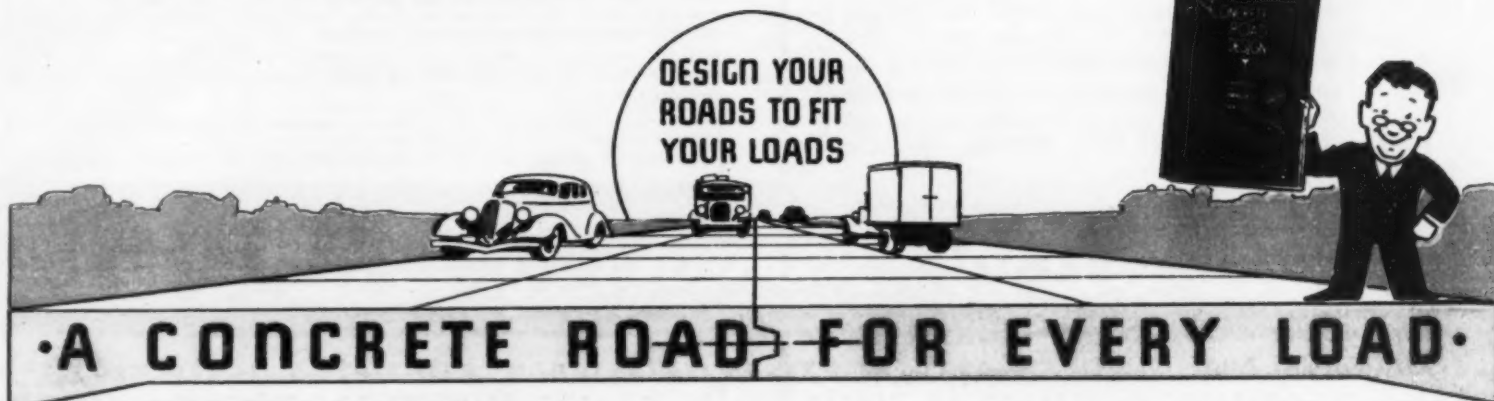
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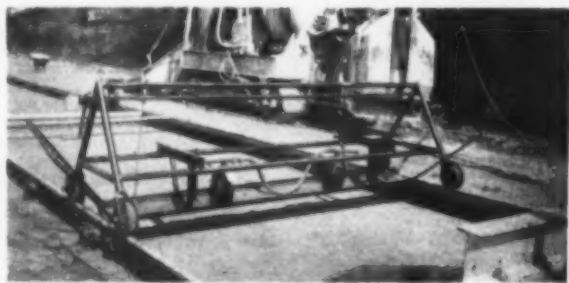
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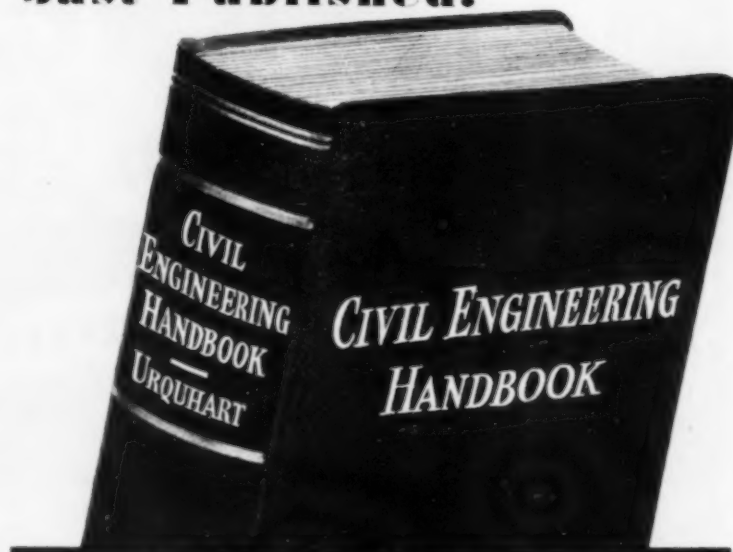
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2. WHY DO SOME MANUFACTURERS HATE TO PICTURE IT?
3. WHY DOESN'T TRU-LAY REQUIRE IT?

Everyone who has ever handled *non*-preformed wire rope knows that, when cut, it requires seizing. Yet how many manufacturers of *non*-preformed wire rope show illustrations of seized ends in catalogs or other advertisements? For one thing, seizings are "eyesores" to artists who produce the illustrations.

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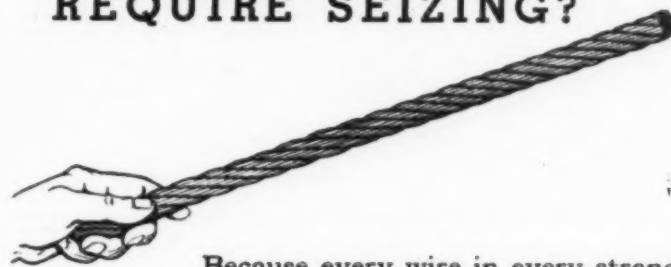


## 2. WHY DO SOME MANUFACTURERS HATE TO PICTURE SEIZING?

Because any wire rope which requires seizing has *internal tension*. It is never relaxed. Strands and wires have a constant tendency to straighten out—to "explode" as a watch spring does when released. Internal tension causes early fatigue. Naturally, no maker of *non*-preformed rope cares to call attention to these facts.



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Page 77



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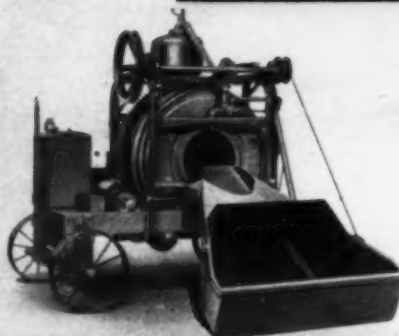
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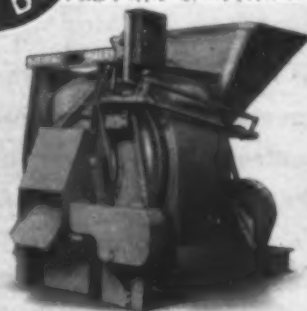
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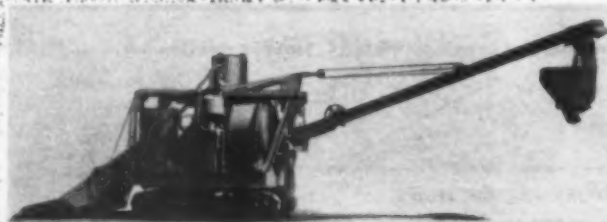
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